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U.S. Rice Production Costs

Workshop Proceedings

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ABSTRACT

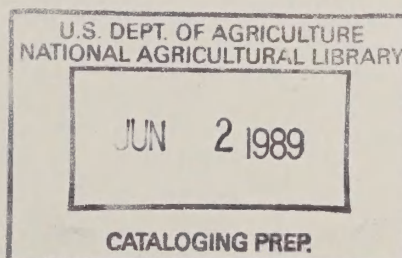
The financial condition of farms is heavily influenced by the level of individual enterprise production costs. This report examines the costs associated with rice production in the United States. Production practices and average production costs are compared for four major rice-producing areas of the country. A farm-level budget generator is used in conjunction with Farm Costs and Returns Survey data to estimate average rice production costs by farm size as well as by total rice acreage. National and regional estimates of the distribution of rice production costs, as well as the average structural and financial characteristics of rice farms, are also presented.

Keywords: Rice, costs of production, production practices, economies of size, farm characteristics, Farm Costs and Returns Survey.

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This report contains papers presented at the U.S. Department of Agriculture's (USDA) Rice Cost of Production Workshop, held on Nov. 19, 1987, at the Rice Research Station, Louisiana Agricultural Experiment Station in Crowley, LA. The purpose of the workshop was to give rice producers and researchers an opportunity to review and comment on rice production cost work being conducted in the Farm Costs and Returns Section, Farm Sector Financial Analysis Branch of USDA's Economic Research Service (ERS). Workshop participants included rice producers and university research and extension personnel from Texas, Arkansas, Mississippi, and Louisiana.

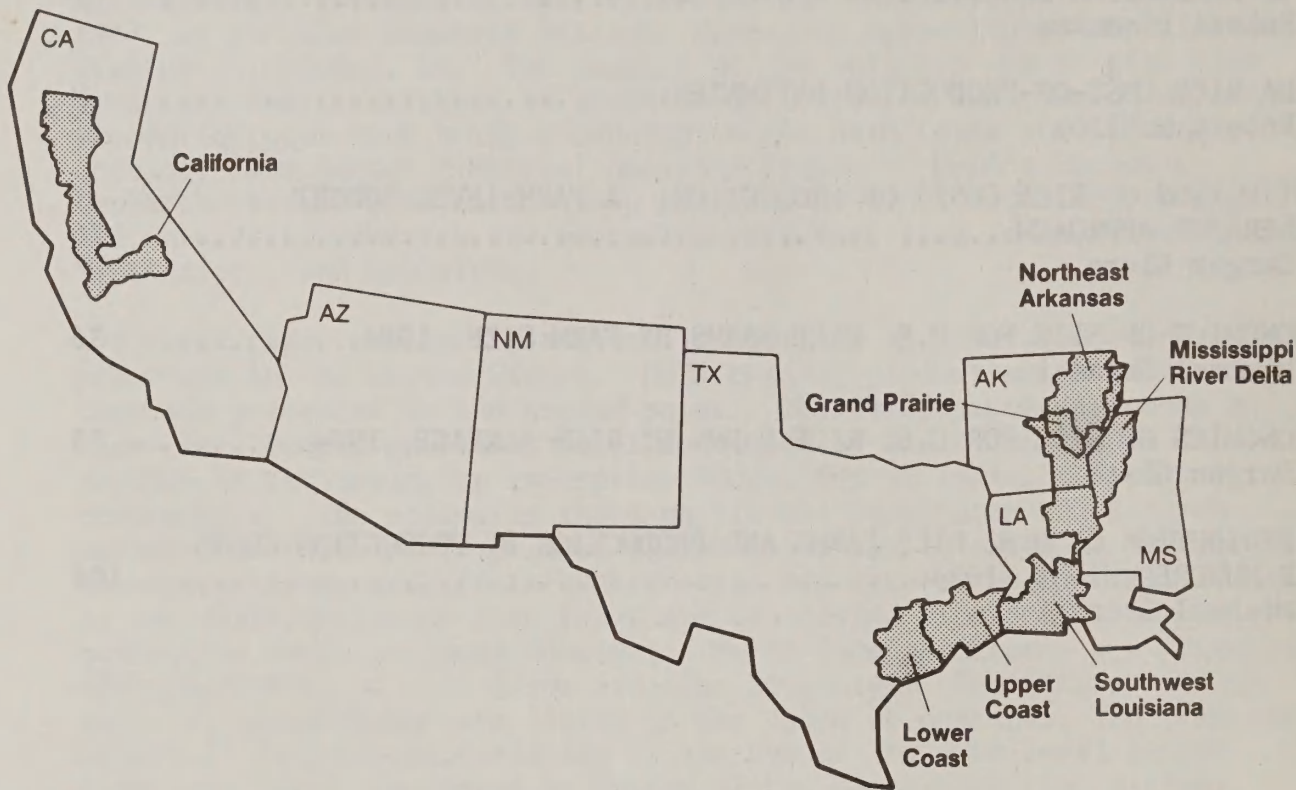
The first paper presents a regional comparison of rice production practices in the United States. USDA cost-of-production estimates for rice are presented in the second paper. The third paper discusses a farm-level budget generator model developed by ERS. This model is capable of estimating an enterprise budget for an individual survey observation. The following three papers use Farm Costs and Returns Survey data with the farm-level budget generator to estimate average rice enterprise production costs by farm-size and rice-acreage class, as well as the distribution of rice farms and associated rice production by production costs per hundredweight. Whole-farm structural and financial characteristics of rice farms are also presented. Presenters of each paper at the workshop are listed in the table of contents. The final four papers in this report, relating to the use of the farm-level budget generator, were coauthored by Dargan Glaze, Robert McElroy, Michael Salassi, and James Johnson.

This workshop was sponsored by the Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA. Branch personnel participating in the workshop included James Johnson, Robert McElroy, Robert Dismukes, Michael Salassi, Robert Dubman, and Dargan Glaze. Michael Salassi provided assistance in organizing the workshop and assembled the papers presented for publication. Joseph Musick, resident director of the Rice Research Station, Louisiana Agricultural Experiment Station helped organize the workshop. Editorial assistance in preparing these papers for publication was provided by Bonnie Moore.

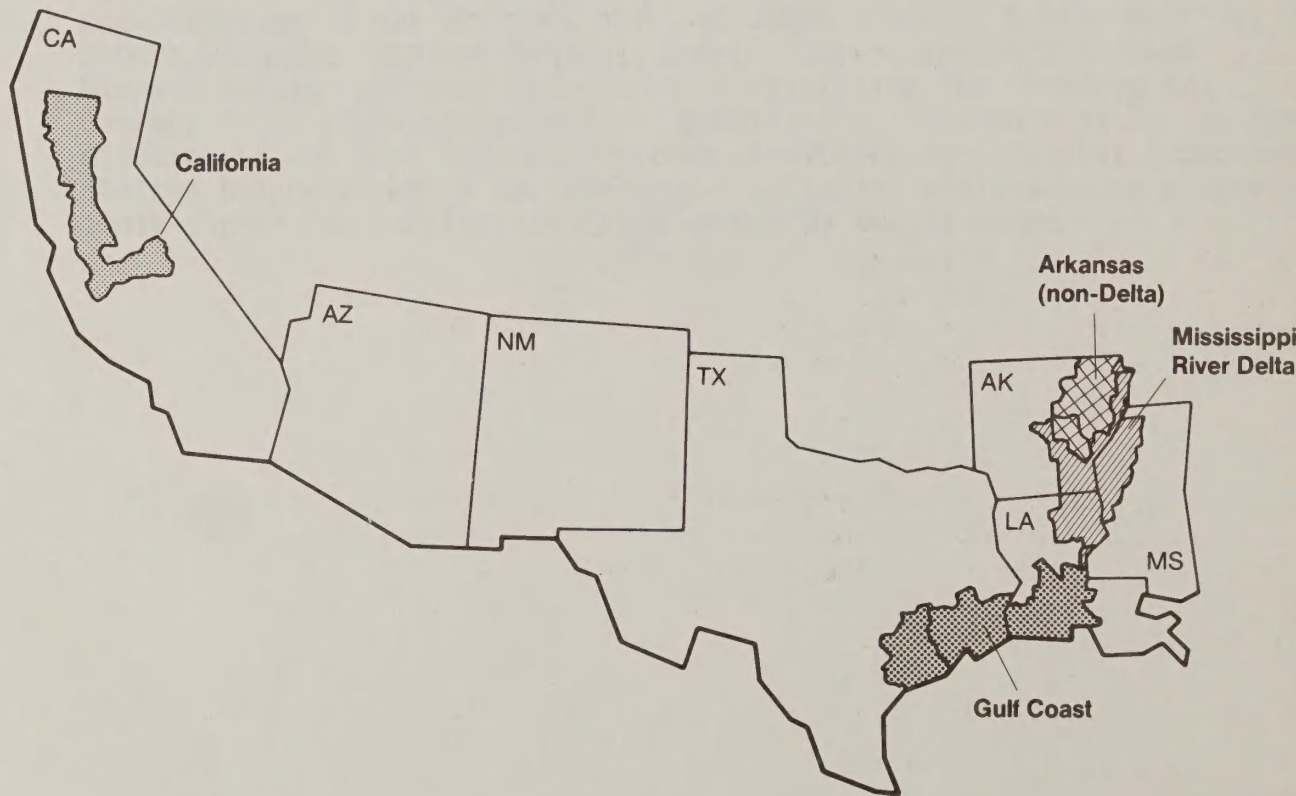
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Figure 1

U.S. Rice Production Regions



USDA Rice Costs-of-Production Regions



Robert Dismukes

The Economic Research Service (ERS) has grouped the rice-producing areas in the United States into seven regions: the Mississippi River Delta, Northeast Arkansas, the Grand Prairie, Southwest Louisiana, the Upper and Lower Coasts of Texas, and California (see map). A rice production budget is constructed for each of these regions. Each budget is a description of production practices, inputs used in rice production, and their prices.

The descriptions of production practices used in the budgets come from periodic surveys of producers. Rice producers were most recently surveyed as part of the 1984 Farm Costs and Returns Survey (FCRS).

The 1984 FCRS was conducted jointly by ERS and the National Agricultural Statistics Service (NASS) in early 1985. The FCRS was a multiframe stratified survey composed of a list frame and an area frame. The list frame (a list of farmers known to have grown rice) was stratified by size. The area frame (aerial photographs of land segments) was stratified by land use. The sample was drawn to represent the population of U.S. rice producers. From the sample, 532 rice farmers completed the questionnaire in 1984. Each completed questionnaire or observation of rice production represented a number of rice farms with similar characteristics. NASS and ERS estimated the number represented, a survey expansion factor. The sample observations were then expanded to population estimates by weighting each observation by its expansion factor. This paper presents estimates of production practices in the population of all rice producers, not just the 532 farmers who completed the questionnaire.

Production Practices

Rice production is generally the same throughout the United States. In 1984, all rice was grown under irrigation and rice field operations were highly mechanized, and nearly every farm producing rice had at least one tractor, truck, combine, and rice buggy. A closer look at rice production in the regions reveals differences that affect costs (table 1).

Water Sources

All rice acreage was irrigated; however, water sources differed. About half of the rice acreage in both regions of Texas was irrigated with water purchased from canal companies, associations, or irrigation districts. Most rice acreage in the Delta, Northeast Arkansas, and Grand Prairie was irrigated with water drawn from producers' wells. In Southwest Louisiana, about half of the acreage was irrigated from wells and a third from surface sources such as rivers, lakes, and ponds.

Dismukes is an agricultural economist in the [Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA.]

Table 1--Selected rice production practices, 1984

Item	Mississippi River Delta	Northeast Arkansas	Grand Prairie	Southwest Louisiana	Upper Texas Coast	Lower Texas Coast	California	United States
<u>Percent of acreage</u>								
Seeded from:								
Airplanes--								
Flooded land-								
Wet seed	2	0	0	52	9	0	94	16
Dry seed	2	0	0	22	26	2	1	4
Dry land	9	3	0	4	30	12	2	2
Drill seeders	71	41	94	16	26	80	1	53
Broadcast seeders	15	56	6	6	9	6	2	21
<u>Pounds per acre</u>								
Seed applied from:								
Airplanes--								
Flooded land-								
Wet seed	D	NA	NA	135	125	NA	160	136
Dry seed	D	NA	NA	145	113	D	D	137
Dry land	135	140	NA	139	117	122	D	134
Drill seeders	105	122	116	126	95	105	D	114
Broadcast seeders	124	142	131	137	127	119	D	138
<u>Percent of acreage</u>								
Irrigated from:								
Wells	88.4	97.8	77.5	46.1	25.6	51.8	4.0	65.7
Canals ^{1/}	.2	0	1.4	21.8	57.5	48.2	85.0	21.4
Surface sources	11.4	4.3	21.1	32.1	16.9	0	11.0	13.4
<u>Pounds per acre</u>								
Fertilizer nutrient:								
Nitrogen	160.2	101.1	122.2	94.3	125.9	134.4	90.4	118.5
Phosphorus	1.4	5.3	5.1	49.2	42.6	42.9	41.8	20.0
Potash	3.1	14.6	8.0	41.5	22.2	27.1	1.9	14.3
<u>Percent of farms</u>								
Pesticides:								
Custom applied	42.1	75.1	57.8	56.1	73.4	77.5	66.8	61.5
Operator applied	32.7	7.0	.2	7.2	1.7	1.7	11.5	10.6
Both custom and operated applied	7.6	2.1	.8	3.4	1.6	4.5	6.4	3.5

D = Insufficient data for disclosure.

NA = Not applicable.

^{1/} Purchased water from canal company, association, or irrigation district.

Source: 1984 Farm Costs and Returns Survey.

Seeding

Seeding method also varied from region to region. Nearly all of the rice acreage in California was seeded from airplanes. On the Upper Coast of Texas and in Southwest Louisiana, air seeding was also a popular practice. Over half of the rice acreage in each region was seeded from airplanes. Seeding with ground equipment predominated in the other regions. Drill seeding was most common in the Delta, the Grand Prairie, and the Lower Coast of Texas. Broadcast seeding was used in Northeast Arkansas.

Seeding rates differed little from region to region. There was, however, a difference according to the seeding method in the amount of seed applied per acre. Aerial- and broadcast-seeding methods were used more than drill-seeding methods.

Fertilizer

The greatest variation in fertilizer use from region to region was in the application of phosphorus and potash. Very little--about 5 pounds per acre or less--phosphorus was applied in the Delta and the two Arkansas regions. More than 40 pounds of phosphorus per acre were applied in the four other regions (Southwest Louisiana, Upper Coast of Texas, Lower Coast of Texas, and California). Rice growers in Southwest Louisiana applied, on average, over 40 pounds of potash per acre, by far the greatest amount in any of the regions.

Nitrogen use was above 120 pounds per acre in the Delta, the Grand Prairie, and the two Texas regions. It was around 100 pounds per acre in Northeast Arkansas and closer to 90 pounds per acre in Southwest Louisiana and California.

These rates are total pounds of nutrient applied divided by planted acres of rice and include all fertilizer applications. If nitrogen were applied to a ratoon rice crop, for example, that amount would be added to all other nitrogen applications and together they would be divided by total planted acres of rice.

Pesticides

The 1984 FCRS offers little description of pesticide practices. FCRS's only questions to rice producers were how much was spent, custom applied, and operator applied for all pesticides in rice production? Rice growers in the Delta applied a large amount of their own pesticides. Custom applications were more popular in all other regions.

A surprisingly large number of rice farms (about 25 percent nationwide) had no pesticide expenditures in 1984. Future surveys will ask more detailed questions about pesticide use.

Field Operations

Field operations performed by rice producers are described in table 2. This description comes from a section of the survey where the producers were asked to list the implements and machinery that they used on their rice crop in 1984. (Operations on set-aside acreage were not included.)

Table 2--Field operations in rice production, 1984 ^{1/}

Item	Mississippi River Delta	Northeast Arkansas	Grand Prairie	Southwest Louisiana	Upper Texas Coast	Lower Texas Coast	California	United States
<u>Times-over ^{2/}</u>								
All field operations	5.29	7.87	6.82	4.29	5.91	9.33	5.62	6.30
Tillage	3.01	5.38	4.48	2.86	4.48	6.75	3.65	4.16
Plowing	.09	.10	.02	.44	.07	.21	1.19	.28
Disking	1.30	2.68	1.96	1.38	1.88	2.30	1.91	1.92
Cultivating	.60	.73	1.56	.47	1.21	1.41	.06	.76
Harrowing	.61	.10	.57	.44	1.10	2.07	.38	.54
Bedding and shaping	.01	.05	.06	.01	.05	.01	.06	.04
Soil packing	.32	1.16	.17	.08	.19	.75	.05	.45
Other tillage	.08	.56	.14	.04	0	0	0	.17
Fertilizer and pesticide applications	.11	.25	.12	.21	.02	.04	.88	.25
Seeding and planting	1.21	1.26	1.31	.25	.44	1.00	.16	.90
Harvesting	.96	.98	.91	.97	.97	1.54	.93	.99
<u>Coefficient of variation</u>								
All field operations	9.88	11.74	4.42	7.23	13.77	5.79	4.94	12.82
Tillage	25.84	18.55	6.12	9.05	15.94	7.11	8.18	20.29
<u>Percent of times-over</u>								
As tandem:								
All field operations	3.0	3.1	4.5	7.6	1.0	1.6	1.7	3.2
Tillage	4.3	3.2	6.8	10.6	1.3	2.0	1.5	4.1
Seeding and planting	2.3	5.3	0	4.8	0	1.1	6.8	2.9
Fertilizer and pesticide applications	0	0	0	13.5	0	0	3.2	3.0

^{1/} Excludes custom-hired operations and land-forming operations.^{2/} Acreage covered in operation divided by planted rice acreage.

Source: 1984 Farm Costs and Returns Survey.

Listed with each implement were the acres that were covered and tractor that pulled it. Custom-hired operations are not included in this section. The field operations are measured in times-over, which is total acres covered in an operation divided by total acres of rice. Costs of using each machine are calculated from times-over. Tillage accounted for about 70 percent of the total times-over in rice production.

The Texas Lower Coast, where ratoon cropping (producing two crops of rice) is prevalent, led all regions in total times-over for all field operations and led in times-over for tillage operations. Northeast Arkansas and the Grand Prairie ranked next, both in total times-over and in tillage, followed by California, the Delta, and Southwest Louisiana.

Performing operations in tandem were more popular in Southwest Louisiana than in other regions. Over 10 percent of the tillage was performed by implements pulled by other implements. The greatest variation in estimates of tillage was in the Delta, followed by Northeast Arkansas and Upper Texas Coast. The acreage covered with seeders and planters in the Delta and in Arkansas indicates that a substantial amount of reseeding was undertaken in these regions in 1984.

Implements

Regular tandem disks were by far the most widely used implements in rice field operations and times-over was the greatest when these disks were used (table 3). Regular tandem disks were the most extensively used tillage implement in all regions except California and Texas Upper Coast. Chisel plows were used more in California, and field cultivators were used more on the Upper Coast of Texas than regular tandem disks.

On the Lower Coast of Texas, where tillage was greatest, much of the additional tillage was performed with field cultivators, spike-toothed harrows, and roller packers. These implements accounted for more of the tillage in Lower Texas than did regular tandem disks.

In the Delta, the two Arkansas regions, and Southwest Louisiana, the greatest percentage of tillage was done with regular tandem disks. These disks were, on average, slightly wider than those in the two Texas regions and California.

Tractors

The average power take-off (pto) horsepower of tractors used with each of the implements is shown in the bottom section of table 3. Spike-toothed harrows used the least pto of any of the most common tillage implements (other than seeders); field cultivators used the most.

Table 4 contains information about the tractors, trucks, combines, and buggies used in rice production. These pieces of equipment may have also been used for other operations on the farm, but their use on the rice crop is what goes into the budgets.

Most farms producing rice used between three and four tractors for rice production. In the two Texas regions, there were on average more than four tractors per farm. In California, there were fewer than three tractors.

Table 3--Selected implements in rice production, 1984 ^{1/}

Item	Mississippi River Delta	Northeast Arkansas	Grand Prairie	Southwest Louisiana	Upper Texas Coast	Lower Texas Coast	California	United States
<u>Times-over ^{2/}</u>								
Chisel plow	0.04	0.04	0	0.01	0.06	0.07	0.93	0.15
Regular tandem disk	1.03	2.46	1.74	.75	.68	1.48	.47	1.36
Field cultivator	.57	.64	1.39	.26	1.10	1.34	.06	.67
Spike-toothed harrow	.12	0	0	.03	.01	.29	.18	.07
Roller packer	.27	.46	.07	.02	.21	.58	.04	.24
Landall	.07	.37	.14	.03	0	0	0	.13
Plain disk drill seeder	.68	.52	.65	.13	.28	.83	.03	.46
<u>Percent of times-over</u>								
Tillage:								
Chisel plow	1.3	.7	0	.3	1.3	1.0	25.5	3.7
Regular tandem disk	34.2	45.7	38.8	26.2	15.2	21.9	12.9	32.8
Field cultivator	18.9	11.9	31.0	9.1	24.6	19.9	1.6	16.0
Spike-toothed harrow	4.0	0	0	1.0	.2	4.3	4.9	1.7
Roller packer	9.0	8.6	1.6	.7	4.7	8.6	1.1	5.7
Landall	2.3	6.9	3.1	1.0	0	0	0	3.1
Seeding and planting:								
Plain disk drill seeder	56.2	41.3	49.6	52.0	63.6	83.0	18.8	50.6
<u>Feet</u>								
Average width of:								
Chisel plow	23.1	19.9	NA	18.7	18.0	17.0	17.3	18.2
Regular tandem disk	21.6	22.2	20.0	21.5	18.0	17.3	18.6	21.0
Field cultivator	27.5	30.6	22.7	19.4	24.3	28.2	23.1	25.7
Spike-toothed harrow	22.8	NA	NA	19.1	20.0	21.9	23.9	21.2
Roller packer	17.7	20.5	14.4	10.4	25.8	28.4	17.5	20.2
Landall	19.5	21.0	20.0	12.7	NA	NA	NA	20.6
Plain disk drill seeder	19.9	18.5	15.5	16.2	17.8	16.6	16.1	17.6
Landplane	17.2	17.8	23.9	17.1	26.2	20.3	17.5	18.8
Levee plow/disk	6.2	10.5	7.0	7.8	10.1	10.9	13.3	8.4
<u>Horsepower</u>								
Average pto for:								
Chisel plow	206.7	142.3	NA	159.0	191.0	136.7	168.0	169.1
Regular tandem disk	165.6	171.3	155.5	176.7	169.6	153.9	173.3	165.4
Field cultivator	172.5	181.1	163.9	150.4	187.6	155.4	195.2	170.1
Spike-toothed harrow	156.1	NA	NA	139.8	140.0	138.5	155.6	141.6
Roller packer	167.1	178.2	115.2	216.2	107.6	120.7	129.6	165.2
Landall	145.8	150.7	144.0	148.5	NA	NA	NA	149.4
Plain disk drill seeder	149.1	137.3	104.2	132.0	122.9	119.8	122.8	127.3
Landplane	175.9	153.4	162.1	170.3	163.5	156.1	173.6	164.7
Levee plow/disk	139.3	143.6	146.2	149.1	146.9	133.7	113.8	143.3

NA = Not applicable.

^{1/} Excludes custom-hired operations and operations done as tandem.^{2/} Acreage covered by implement divided by planted rice acreage.

Source: 1984 Farm Costs and Returns Survey.

Table 4--Tractors, trucks, and buggies in rice production, 1984

Item	Mississippi River Delta	Northeast Arkansas	Grand Prairie	Southwest Louisiana	Upper Texas Coast	Lower Texas Coast	California	United States
<u>Number per farm</u>								
Tractors:								
Two-wheel drive	3.0	3.0	3.4	3.1	2.6	3.0	0.1	2.9
Four-wheel drive	.8	.6	.3	.7	1.7	1.1	.8	.7
Crawler	<u>1/</u>	0	<u>1/</u>	<u>1/</u>	<u>1/</u>	0	2.0	.2
Four-wheel assisted	.1	<u>1/</u>	<u>1/</u>	.1	.1	0	<u>1/</u>	.1
Trucks:								
Pickup	1.8	1.8	1.2	1.6	2.2	2.0	2.7	1.7
Single-axle	1.6	1.5	1.5	1.2	1.0	.9	1.3	1.4
Tandem-axle	.5	.2	.7	.3	.4	.3	.9	.4
Semi	.2	.2	.1	.2	.1	.1	.1	.2
Combines:								
Two-wheel drive	1.0	.6	1.1	1.1	1.3	1.9	<u>1/</u>	.9
Four-wheel drive	.5	.3	.3	.3	.7	0.2	<u>1/</u>	.3
Track drive	.1	0	0	0	0	<u>1/</u>	1.3	.1
Combination drive	<u>1/</u>	.3	0	0	<u>1/</u>	0	.4	.1
Rice buggies	1.2	1.6	1.5	1.4	1.8	2.1	1.3	1.5
<u>Horsepower</u>								
Average pto per tractor:								
Two-wheel drive	137.6	125.2	131.7	116.9	117.8	111.1	97.1	127.0
Four-wheel drive	182.4	210.5	181.1	172.4	187.5	164.3	186.7	188.1
Crawler	137.7	NA	116.1	76.0	78.0	NA	167.9	163.6
Four-wheel assisted	204.8	196.6	NA	125.9	229.6	NA	123.8	170.8
<u>Coefficient of variation</u>								
Average pto per tractor:								
Two-wheel drive	3.17	2.91	5.09	2.99	2.81	2.76	5.55	3.61
Four-wheel drive	7.09	4.10	9.65	5.88	5.76	5.14	3.28	5.46
Crawler	44.52	NA	25.29	27.94	1.65	NA	5.29	4.80
Four-wheel assisted	5.15	37.86	NA	37.36	19.34	NA	8.40	17.54

NA = Not applicable.

1/ Less than one-tenth.

Source: 1984 Farm Costs and Returns Survey.

Two-wheel-drive tractors were the most common tractors used in all regions, except California. Crawlers were the most common tractors used in California rice production. Four-wheel-drive tractors were most often used in Texas. Two-wheel-drive tractors provided the least pto, and four-wheel-drive tractors the most.

Combines and Buggies

Two-wheel-drive combines, like two-wheel-drive tractors, were the most common type of combine in all regions, except California. In California, track and combination track-wheel drive combines were most common. Two- and four-wheel-drive combines were seldom used to harvest rice in California.

The use of rice buggies to cart the harvest from the combines was widespread. There was, on average, more than one rice buggy per farm in all regions. The two Texas regions had the greatest number of rice buggies per farm.

Summary

Average production practices vary from region to region. Major differences in rice production practices are in water sources, seeding methods, fertilizer and pesticide use, and the extent of field operations undertaken. In total times-over (acres covered in all operations divided by rice acreage), the rice producing regions ranked: 1) Texas Lower Coast, 2) Northeast Arkansas, 3) Grand Prairie, 4) Texas Upper Coast, 5) California, 6) Mississippi River Delta, and 7) Southwest Louisiana.

These production practice data are the basis of rice cost-of-production estimates that are published annually by ERS. They are summarized as average or typical production practices per acre of rice and then are combined with other data on levels of input use and prices to form seven budgets for rice production, one for each of the regions. These seven regions are aggregated (based on acres planted to rice) into four regional estimates and a national estimate of the average cost of production.

Robert McElroy

Estimating crop and livestock costs of production (COP) has been a major component of U.S. Department of Agriculture's (USDA) economic analysis since the early 1900's. In the early studies, the emphasis was on firm-level farm management, using cost accounting, to estimate enterprise profitability. By 1918, conflict had developed as some policymakers wanted to use COP to set farm prices. In the thirties, the cost studies were the major input to the agricultural adjustment programs and were being used to analyze production response, economic outlook, and efficient location of production.

In 1973, USDA was officially mandated to make annual estimates of costs of production for the major program commodities (wheat, feed grains, rice, cotton, and milk). The Economic Research Service (ERS) was assigned the task and established a project to conduct surveys and estimate the costs. COP was never used directly to set or adjust support prices until 1977. In the 1977 Farm Act, target prices were set and COP estimates were to be used for annual updating. COP was strictly defined in the legislation. The legislation was revised in 1981 with more general terminology to say "include all typical variable costs, including interest costs, a return on fixed costs, and a return to management." USDA revised some of its procedures and changed the format for presenting costs into what we have today.

While COP studies have been in use for more than a half century, many issues still exist with regard to the proper estimation procedures for, and the uses of, the costs. These include, in part, the allocation of whole-farm fixed costs (such as overhead to individual enterprises), the costs to impute to noncash expenses (such as an operator's own labor), and the costs of land. ERS is keenly interested in gaining a better understanding of these problems and their effects on the quality and use of the COP estimates.

Using a Budget Generator to Estimate Production Costs

The main functions of the ERS program for developing COP estimates are:

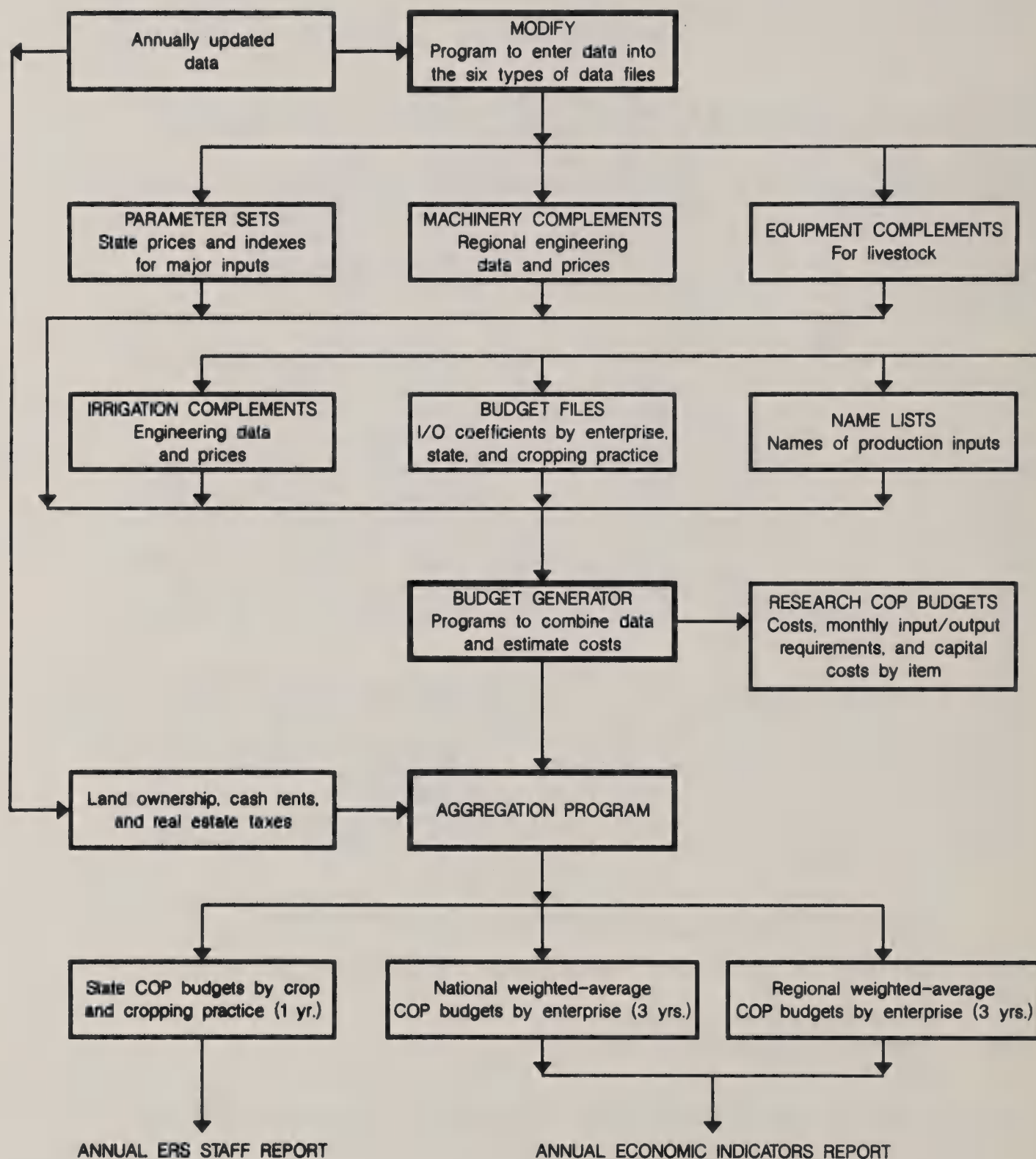
1. Collecting and filing data,
2. preparing enterprise budgets, and
3. calculating national and regional weighted-average costs.

Data are sorted by region and by input item and then are entered into the computer.

Figure 1 shows the data flow through the COP system, when using the Firm Enterprise Data System (FEDS) budget generator, to produce COP estimates. This figure appears very complicated but the budget generator

McElroy is an agricultural economist in the Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA.

Figure 1 Costs-of-production (COP) and budget generator flow diagram



is simply a collection of raw data files and a set of arithmetic problems. The budget generator takes the pertinent data and combines them to estimate a cost.

Data Files

Six basic files are associated with the budget generator: 1) parameter sets, 2) machinery complements, 3) equipment complements, 4) irrigation complements, 5) budget files, and 6) name lists. Because these terms will be used during this workshop, some definitions are needed.

1. Each State that has a COP enterprise has its own parameter set. Parameter data sets are costs and indexes of items that do not change by commodity or enterprise within a State. For example, fuel and fertilizer prices are parameter-set data.
2. Regional machinery complements contain the engineering data necessary to estimate fuel costs, repairs, depreciation, labor, and other costs that are dependent on the field work. Up to 100 individual machines are listed with each machine's price, average annual use, field efficiency, and engineering coefficients used for estimating certain other costs (such as fuel and repairs).
3. Regional equipment complements are similar in content to the machinery complements except that they describe livestock facilities (such as pole barns, front-end loaders, manure scrapers, and other items).
4. Some 400 irrigation complements are used to describe the irrigation system used for growing a specific crop in a specific State. Each irrigation file contains information to describe the wells or water source, the pumps, the distribution systems, and component costs. The budget generator uses these data to estimate the cost of the system.
5. Each enterprise in each State has its own budget file. There are 3 years of data in the budget files. Seeding rates, fertilizer application rates, machinery times-over, and which parameter set and machinery complement to use are examples of budget file data. Prices of some inputs (such as seed) are also included. Annual updating is frequently done by a direct update of the budget file. For example, commodity yields and prices and seed prices are updated yearly. When new Farm Costs and Returns Survey (FCRS) data are available, the entire data matrix must be entered.
6. The name list file contains the names of the inputs and outputs that are used when the budgets are printed. Each line in the budget file is referenced with a line in the name list so that each final cost will be correctly identified.

Examples of Using Data in the Data Files

Some examples will show how the production practice data are used in the budget generator to arrive at an estimated cost of production. There are

seven basic rice budgets that are prepared; we will use the one for Southwest Louisiana for demonstration.

1. Survey data showed that the average seeding rate in the Southwest Louisiana region in 1984 was 136 pounds per planted acre. This was calculated by taking the seeding rate for each seeding method and weighting by the respective acreage. The price of the seed from National Agricultural Statistics Service (NASS) was \$.178 per pound. Both these figures are entered into the budget file (table 1).
2. Farm interviews indicated that the average application rate of nitrogen (N) was 94 pounds per planted acre, divided into two equal applications in March and June. These data are entered into the budget file. The nitrogen price is not entered into the budget file because a bag of fertilizer costs the same whether it is applied to rice, corn, or some other crop. The nitrogen price qualifies as parameter-set data and is located on line 24 of table 2. When the costs are estimated and the budget printed, the two items, quantity (94 pounds) and price (\$0.239), are multiplied to give the resulting \$22.47 per planted acre.
3. Interpreting the machinery data used in the budgets is more difficult. Because the budget represents an "average acre of rice," the machine use is averaged according to the acres covered for each field operation reported in the survey. These acres are converted to "times-over" and entered into the budget file. Several implements can be used for the same operation. One farmer can plow his land, while another can obtain similar results with a disk. Both implements could be included in the budget, but the times-over would not necessarily sum to one or two but some fraction. In the budget file, all the moldboard plows were consolidated into an average 18.9-foot plow with an average size of more than five bottoms; these plows are used to plow 44 percent of the acre. Two disks and a harrow are also used so that the acre is gone over about twice for land preparation. This specific moldboard plow, listed in the budget file as having power unit 7 and machine code 31, is more fully described in the machinery complement (table 3). Looking at machinery complement 40, which is specific to the Gulf Coast, one can see power unit (line) 7 is a 135-horsepower (hp) tractor with an initial list price of \$44,667 and an average purchase price of \$35,384. Furthermore, this size tractor averages 10 years of age and is used, on average, 605 hours per year. The data on age and annual use are used to calculate an estimate of depreciation. Line 31 lists the same type information for the plow. Other data, taken from tractor tests and other engineering studies, are also stored in the machinery complement, allowing for estimation of fuel use, repair costs, and tax and insurance charges. The machinery complement data for most machines are not specific to any one crop but are averages for the region.
4. General farm overhead and cash interest expenses are handled outside the regular budget generator. This is because surveys

Table 1--Budget file for rice, Southwest Louisiana, final 1984

Line	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 Jun	7 Jul	8 Aug	9 Sep	10 Oct	11 Nov	12 Dec	13 Price	14 Share rent	15 Unit code	16 Item code	17 Type	18 Cont
Production																		
1 Rice	0	0	0	0	0	0	0	0	41.38	0	0	0	7.820	0.260	16	78	2	0
Operating inputs													Price	Share rent	Unit code	Item code	Type	Harv code
6 Chemicals	0	0	0	0.50	0	0.50	0	0	0	0	0	0	7.040	0.060	7	236	3	0
7 Pesticide appl.	0	0	0	.50	0	.50	0	0	0	0	0	0	17.760	.050	7	331	3	0
8 Survey levees	0	0	0.15	0	0	0	0	0	0	0	0	0	1.590	0	7	375	3	0
9 Custom air seed	0	0	.53	.52	0	0	0	0	0	0	0	0	3.250	0	16	337	3	0
10 Seed	0	0	136.00	0	0	0	0	0	0	0	0	0	.178	.060	12	180	3	0
11 Nitrogen	0	0	47.00	0	0	47.00	0	0	0	0	0	0	0	.080	12	211	3	0
12 Phosphate	0	0	49.00	0	0	0	0	0	0	0	0	0	0	.080	12	214	3	0
13 Potash	0	0	42.00	0	0	0	0	0	0	0	0	0	0	.080	12	216	3	0
14 Custom air fert.	0	0	1.20	0	0	1.00	0	0	0	0	0	0	5.790	.060	7	338	3	0
15 Custom hauling	0	0	0	0	0	0	0	0	8.56	0	0	0	.280	.020	16	322	3	9
16 Drying	0	0	0	0	0	0	0	0	38.64	0	0	0	.960	.120	16	432	3	9
17 Gen farm overhd	0	0	0	0	0	0	0	0	1.00	0	0	0	16.560	0	0	459	3	0
18 Irrigation water	0	0	0	0	.25	.25	.25	.25	0	0	0	0	47.320	.030	7	468	3	0
19 Technical svcs	0	0	1.00	0	0	0	0	0	0	0	0	0	.680	.000	7	383	3	0
Machinery requirements													Width	Crew size	Power Unit	Mach code	Type	Harv code
21 MB plow 5B+	0	0	0	0	0	0	0	0	0	0.44	0	0	18.900	1.000	7	31	4	0
22 Tandem disk 15+	0	0	.50	.44	0	0	0	0	0	0	0	0	20.700	1.000	9	49	4	0
23 Harrow-spike	0	0	0	.11	0	0	0	0	0	0	0	0	20.700	1.000	0	43	4	0
24 Single disk	0	0	.39	0	0	0	0	0	0	0	0	0	17.300	1.000	8	52	4	0
25 Field cult. 23	0	0	.34	0	0	0	0	0	0	0	0	0	20.400	1.000	8	36	4	0
26 Harrow-spike	0	0	0	.06	0	0	0	0	0	0	0	0	23.100	1.000	9	43	4	0
27 Rail-pipe-log	0	0	.07	.08	0	0	0	0	0	0	0	0	17.300	1.000	8	55	4	0
28 Culti-packer	0	0	.15	.15	0	0	0	0	0	0	0	0	19.500	1.000	8	58	4	0
29 Roto tiller	0	0	0	.03	0	0	0	0	0	0	0	0	12.700	1.000	7	54	4	0
30 Trlr spreader	0	0	.06	.06	0	0	0	0	0	0	0	0	38.400	1.000	5	62	4	0
31 Anhy appl.	0	0	0	.02	0	0	0	0	0	0	0	0	14.000	1.000	4	60	4	0
32 Sprayer	0	0	0	.02	0	0	0	0	0	0	0	0	30.000	1.000	9	64	4	0
33 Grain drill 15+	0	0	.07	.07	0	0	0	0	0	0	0	0	17.100	1.000	7	67	4	0
34 Broadcast sdr	0	0	0	.02	0	0	0	0	0	0	0	0	21.000	1.000	7	80	4	0
35 SP comb-sm1	0	0	0	0	0	0	0	0	1.00	0	0	0	17.100	1.000	0	16	4	9
36 Landplane	0	0	.04	.04	0	0	0	0	0	0	0	0	0	1.000	7	90	4	0
37 Levee disk	0	0	.38	.38	0	0	0	0	0	0	0	0	0	1.000	6	75	4	0
38 Rice buggy	0	0	0	0	0	0	0	0	1.00	0	0	0	0	1.000	7	96	4	9
39 Truck-single 2t.	0	0	0	0	0	0	0	.28	.28	0	0	0	0	1.000	0	11	4	9
40 Pickup 3/4 t.	0	0	.20	.40	.40	.20	.20	.40	.62	0	0	0	0	1.000	0	10	4	0
41 Truck tandem	0	0	0	0	0	0	0	.45	.46	0	0	0	0	1.000	0	12	4	9
49 Acin irrig water	0	0	0	2.91	9.70	8.40	6.79	5.82	1.94	0	0	0	.700	.580	0	0	.067	0
50 Other labor	0	0	.20	.20	.20	.20	.20	.20	.20	.08	0	0	0	0	0	0	4.	0

78% air seeded. 85% dried. 19% custom hauled.

4/1/87

Water--46% wells--275' depth, 100' lift, 1835 gpm, nat gas,

Dismukes

Machinery complement 40

Low lift 3600 gpm, diesel--32% surface--22% purchased.

Equipment complement 0

Name set 1
Parameter set 22

Table 2--Crop parameter sets for state 22-Louisiana

No. Description	Parameter file		
	24	25	26
1. Gasoline price (\$/gal)	.9100	.5200	.8600
2. L.P. price (\$/gal)	.5800	.4400	.6500
3. Diesel price (\$/gal)	.5100	.3000	.6400
4. Elec. price (\$/kw.hour)	.0800	.0810	.0700
5. N. G. price (\$/1,000CF)	5.5400	5.7100	5.5400
6. Interest rate (opr cap)	.0766	.0558	.0980
7. Machinery insur rate	.0060	.0060	.0060
8. Machinery tax rate	.0100	.0100	.0100
9. Interest rate(land val	.0214	.0216	.0226
10. Wage rate mach. labor	4.1700	4.0400	4.2300
11. Wage rate other labor	4.1700	4.0400	4.2300
12. Wage rate irrig labor	4.1700	4.0400	4.2300
13. Death loss	0	0	0
14. Livestock insur rate	0	0	0
15. Equipment insur rate	0	0	0
16. Livestock tax rate	0	0	0
17. Equipment tax rate	0	0	0
18. Irrigation labor	0	0	0
19. Machine time constant	1.1000	1.1000	1.1000
20. Tractor time constant	1.1000	1.1000	1.1000
21. Self-prop mach time c	1.2000	1.2000	1.2000
22. Crop management charg	.1000	.1000	.1000
23. Livestock mgmt charge	0	0	0
24. Nitrogen price (\$/lb)	.2340	.2080	.2390
25. Phosphate pric (\$/lb)	.2170	.2000	.2430
26. Potash price (\$/lb)	.1170	.1170	.1300
27. Lime price (\$/ton)	4.8000	16.1000	16.0000
28. General farm overhead	0	0	0
29. BTU drying constant	0	0	0
30. Land taxes	0	0	0
31.	0	0	0
32.	0	0	0
33.	0	0	0
34.	0	0	0
35. Year	1985.0000	1986.0000	1984.0000
36.	0	0	0
37.	0	0	0
38.	0	0	0
39.	0	0	0
40.	0	0	0
41.	0	0	0
42. Equipment costs ndx-2	0	0	0
43. Equipment costs ndx-3	0	0	0
44. Equipment costs ndx-4	0	0	0
45. Equipment costs ndx-5	0	0	0
46. Equipment costs ndx-6	0	0	0
47. Machinery costs index	1.0088	1.0000	1.0065
48. Machinery costs index	.8259	.9089	.7444
49. Custom op costs index	1.0135	1.0135	1.0000
50. Pesticides costs ndx	1.0000	0.9844	1.0000

Table 3--Machinery complement 40 (general coefficients), Gulf Coast

Column Name of machine	1 Code	2 Width (feet)	3 Initial list price	9 Hours used annually	10 Years owned	13 Purchase price	14 Fuel type	16 Hp	18 Age when purchased	19 Total hours used
Tract 2wd 40 hp	1.	40.0	12790.	350.	18.0	11560.	3.	40.	0	0
Tract 2wd 55 hp	2.	55.0	17260.	420.	15.0	14856.	3.	55.	0	0
Tract 2wd 70 hp	3.	70.0	22075.	515.	12.0	18998.	3.	70.	0	0
Tract 2wd 85 hp	4.	85.0	26900.	535.	12.0	23418.	3.	85.	0	0
Tract 2wd 100 hp	5.	100.0	31760.	665.	10.0	27647.	3.	100.	0	0
Tract 2wd 115 hp	6.	115.0	36648.	630.	10.0	29033.	3.	115.	0	0
Tract 2wd 135 hp	7.	135.0	44667.	605.	10.0	35384.	3.	135.	0	0
Tract 2wd 160 hp	8.	160.0	56123.	675.	9.0	45070.	3.	160.	0	0
Tract 4wd 175 hp	9.	175.0	63324.	660.	10.0	47498.	3.	175.	0	0
Pickup 3/4 ton	10.	.8	12915.	565.	6.0	11315.	1.	1.	0	0
Truck-single 2t.	11.	2.0	28047.	140.	23.0	24573.	1.	1.	0	0
Truck tandem	12.	4.0	44224.	150.	21.0	38747.	3.	1.	0	0
SP rice buggy	13.	16.0	55860.	400.	5.0	47020.	3.	1.	0	0
	14.	0	0	0	0	0	0	0	0	0
	15.	0	0	0	0	0	0	0	0	0
SP comb-sm1	16.	16.0	76135.	400.	5.0	64641.	3.	1.	0	0
	17.	0	0	0	0	0	0	0	0	0
	18.	0	0	0	0	0	0	0	0	0
	19.	0	0	0	0	0	0	0	0	0
	20.	0	0	0	0	0	0	0	0	0
	21.	0	0	0	0	0	0	0	0	0
	22.	0	0	0	0	0	0	0	0	0
	23.	0	0	0	0	0	0	0	0	0
	24.	0	0	0	0	0	0	0	0	0
	25.	0	0	0	0	0	0	0	0	0
	26.	0	0	0	0	0	0	0	0	0
	27.	0	0	0	0	0	0	0	0	0
	28.	0	0	0	0	0	0	0	0	0
	29.	0	0	0	0	0	0	0	0	0
	30.	0	0	0	0	0	0	0	0	0
MB plow 5B+	31.	1.0	1162.	100.	12.0	1057.	0	0	0	0
Chisel 15	32.	1.0	291.	100.	12.0	263.	0	0	0	0
Chisel 15+	33.	1.0	372.	100.	12.0	335.	0	0	0	0
Subsoiler	34.	1.0	382.	100.	12.0	345.	0	0	0	0
	35.	0	0	0	0	0	0	0	0	0
Field cult. 23	36.	1.0	216.	100.	12.0	208.	0	0	0	0
Field cult. 23+	37.	1.0	351.	100.	12.0	329.	0	0	0	0
Rotary hoe	38.	1.0	251.	40.	30.0	226.	0	0	0	0
Row cultivator	39.	1.0	246.	100.	12.0	221.	0	0	0	0
Rolling cult.	40.	1.0	306.	100.	12.0	278.	0	0	0	0
	41.	0	0	0	0	0	0	0	0	0
	42.	0	0	0	0	0	0	0	0	0
Harrow-spike	43.	1.0	55.	40.	30.0	49.	0	0	0	0
Flex-tine harrow	44.	1.0	110.	40.	30.0	98.	0	0	0	0
	45.	0	0	0	0	0	0	0	0	0
Springtooth 15+	46.	1.0	151.	100.	12.0	134.	0	0	0	0
	47.	0	0	0	0	0	0	0	0	0
	48.	0	0	0	0	0	0	0	0	0
Tandem disk 15+	49.	1.0	542.	100.	12.0	490.	0	0	0	0
LT offst dsk 15	50.	1.0	507.	100.	12.0	304.	0	0	0	0

Table 3--Machinery complement 40 (engineering coefficients), Gulf Coast

Column	1	4	5	6	7	8	11	12	15	17
	Code	Speed (mph)	Field effic- iency	RC1	RC2	RC3	RFV1	RFV2	Hours of life	Fuel multi- plier
Tract 2wd 40 hp	1.	0	0	1.20	.000631	1.60	0.680	0.920	12000.	0.048
Tract 2wd 55 hp	2.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 2wd 70 hp	3.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 2wd 85 hp	4.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 2wd 100 hp	5.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 2wd 115 hp	6.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 2wd 135 hp	7.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 2wd 160 hp	8.	0	0	1.20	.000631	1.60	.680	.920	12000.	.048
Tract 4wd 175 hp	9.	0	0	1.00	.000631	1.60	.680	.920	12000.	.048
Pickup 3/4 ton	10.	30.0	0	.80	.001590	1.40	.600	.885	4000.	2.500
Truck-single 2t.	11.	25.0	0	.80	.001590	1.40	.600	.885	4000.	4.000
Truck tandem	12.	25.0	0	.80	.001590	1.40	.600	.885	4000.	3.000
SP rice buggy	13.	1.0	.600	.80	.001590	1.40	.600	.885	4000.	3.000
	14.	0	0	0	0	0	0	0	0	0
	15.	0	0	0	0	0	0	0	0	0
SP comb-sml	16.	1.0	.600	.33	.000251	1.80	.640	.885	3500.	4.500
	17.	0	0	0	0	0	0	0	0	0
	18.	0	0	0	0	0	0	0	0	0
	19.	0	0	0	0	0	0	0	0	0
	20.	0	0	0	0	0	0	0	0	0
	21.	0	0	0	0	0	0	0	0	0
	22.	0	0	0	0	0	0	0	0	0
	23.	0	0	0	0	0	0	0	0	0
	24.	0	0	0	0	0	0	0	0	0
	25.	0	0	0	0	0	0	0	0	0
	26.	0	0	0	0	0	0	0	0	0
	27.	0	0	0	0	0	0	0	0	0
	28.	0	0	0	0	0	0	0	0	0
	29.	0	0	0	0	0	0	0	0	0
	30.	0	0	0	0	0	0	0	0	0
MB plow 5B+	31.	4.5	.800	1.00	.002510	1.30	.600	.885	2500.	0
Chisel 15	32.	5.0	.800	1.20	.002510	1.30	.600	.885	2500.	0
Chisel 15+	33.	5.0	.800	1.20	.002510	1.30	.600	.885	2500.	0
Subsoiler	34.	4.0	.800	1.20	.002510	1.30	.600	.885	2500.	0
	35.	0	0	0	0	0	0	0	0	0
Field cult. 23	36.	5.0	.800	1.00	.000251	1.80	.600	.885	2500.	0
Field cult. 23+	37.	5.0	.800	1.00	.000251	1.80	.600	.885	2500.	0
Rotary hoe	38.	7.5	.750	1.00	.002510	1.30	.600	.885	2500.	0
Row cultivator	39.	3.2	.800	1.00	.000251	1.80	.600	.885	2500.	0
Rolling cult.	40.	3.2	.800	1.00	.000251	1.80	.600	.885	2500.	0
	41.	0	0	0	0	0	0	0	0	0
	42.	0	0	0	0	0	0	0	0	0
Harrow-spike	43.	4.5	.800	.65	.000251	1.80	.600	.885	2500.	0
Flex-tine harrow	44.	4.5	.800	.65	.000251	1.80	.600	.885	2500.	0
	45.	0	0	0.0	0	0	0	0	0	0
Springtooth 15+	46.	4.5	.800	1 0	.000251	1.80	.600	.885	2500.	0
	47.	0	0	0	0	0	0	0	0	0
	48.	0	0	0	0	0	0	0	0	0
Tandem disk 15+	49.	4.5	.800	.65	.000251	1.80	.600	.885	2500.	0
LT offst disk 15	50.	4.5	.800	.65	.000251	1.80	.600	.885	2500.	0

have been developed to provide new and improved data, which were not programmed into the main routine. These expenses are farm-level costs and are difficult to allocate to the various enterprises on the farm. ERS allocates these costs among the commodities by first calculating the expense per dollar of total farm sales, then applying this percentage to the estimated receipts for the individual crop.

5. Budgets are prepared in two ways. The lowest level of aggregation is either the State or a major substate region (such as Southwest Louisiana) for rice. USDA's annual cost-of-production report, however, contains regional and national weighted-average cost estimates. These are obtained using the budget generator's aggregation program to combine several budgets (such as Southwest Louisiana and the Upper and Lower Coasts of Texas), weighting each cost component in each of the smaller areas by each area's share of total production in the larger region, and estimating an aggregated budget. The resulting region is the Gulf Coast.

Enterprise Budgets

ERS prepares and presents COP estimates as enterprise budgets, that summarize all operator and landlord costs and returns associated with producing a commodity. ERS prepares enterprise budgets on a per-unit basis, such as a planted acre. A State enterprise budget or, in this case, a substate region, covers each commodity in each major producing region. The budget represents the weighted-average production technology and input use.

Each enterprise budget contains cost and return measures separated into three major categories: cash receipts, cash expenses, and economic (full ownership) costs.

Cash Receipts and Cash Expenses

Cash receipts measure the gross value of production, allowing analysts to estimate the residual returns to management and owned resources used in producing crops. Receipt information used to calculate net returns allows one to review the economic performance of a commodity in a particular year or over time. Cash expenses account for the variable and fixed inputs and are out-of-pocket costs incurred during production.

The cashflow position of producers is determined by subtracting cash expenses from the value of production (cash receipts). ERS tabulates cash returns (receipts less expenses) before and after a charge for replacing the capital invested in buildings and machinery. In any given year, an operator may defer machinery and equipment purchases, depending on the income or tax position of the farm. Over the long run, operators must set aside funds to replace equipment. The remaining cash returns reflect funds available for family living, debt retirement, or other discretionary uses and should provide for depreciation of machinery and equipment.

Economic (Full Ownership) Costs

Total economic costs and returns can be used to compare regions or commodities without regard for equity levels or tenure of producers. For example, the cash expenses of two farm operators who produce rice may differ because of differing levels of debt, even if they use identical practices and technology on similar land.

Economic costs consist partly of variable expenses (less actual interest charges) plus general farm overhead, taxes and insurance, and the charge for capital replacement. If the total costs of these items are subtracted from cash receipts, the remainder is a return to the farmer to cover the costs of land, machinery, labor, and capital invested in operating inputs during production. The cost allocated to land, machinery, and labor is based only on the imputed value of each item used for crop production.

Individual operators have many methods of allocating residual returns to cover the costs of owned or fixed resources. Some operators assign a proportionately large return to cover landownership costs and then leave a small return to unpaid labor; others may do the opposite. To allocate residual returns to each asset, the COP budgets use the annual rate of return the producer could expect capital to earn in the current year without accounting for inflation or deflation.

The earnings value of an owner-supplied input during production is difficult to determine. One cannot easily assess the additional revenue earned when a producer invests more money in operating inputs rather than incurring additional short-term debt. Therefore, the estimates in this report are calculated by assuming that producers expect money invested in variable production inputs to earn at least as much as if it were placed in a savings account or a similar financial instrument. Thus, a relatively risk-free rate of return (which is the opportunity cost of the funds) is used to estimate an imputed annual return to invested operating capital. ERS uses the average 6-month U.S. Treasury bill rate.

ERS uses a similar procedure to value the time the operator and other individuals work on the farm. Operator's unpaid labor is worth the equivalent of the hired-labor wage rate. Any additional return reflecting the operator's entrepreneurial skill appears in the residual return to management and risk. A single longrun real rate of return is used to estimate the annual expected return the average producer might receive from capital invested in machinery and other nonland production assets.

Data are not available to estimate rates specific to various commodities and regions. Returns to land for crops include rental value as a proxy for land returns rather than the real rate of return to production assets.

The return to management and risk is the residual amount after deducting all the above costs from total receipts. The return to management and risk can be evaluated only in light of the given allocation of residual returns and is directly comparable when the same procedure is used for each commodity. The longrun return to risk is expected to average near zero; the residual return to risk could be positive or negative,

depending on weather and supply and demand factors. The return to management should be positive, but the level remains unknown and is speculative. Therefore, the residual return to management and risk is expected to average above zero over time.

Four cost indicators and three return indicators can be derived from each budget. These indicators can be used for many purposes so correct selection of the proper cost or return depends entirely on the user's objectives.

Cost Indicators

Total cash expense reflects the shortrun out-of-pocket variable and fixed costs incurred, and minimum breakeven price needed, to raise and harvest a crop with a given yield on an average acre of cropland.

Total cash expense with replacement reflects all cash expenses and the additional dollars needed to replace the machinery and equipment used in crop production. Capital stock must be replaced in a timely manner to maintain productive capacity over time.

Economic costs excluding land reflect all cash expenses (less cash interest), capital replacement, and allocated returns to unpaid labor, operating capital, and nonland capital. ERS imputes the allocated returns for some items because they cannot be measured directly. Economic costs indicate the average longer run costs, which must be covered to keep an acre of land in production before land rent is paid, whether to the owner-operator or to the landholder.

Economic costs including land reflect total economic costs, including an estimated rent to the landowner. On a per-unit basis, these costs show the breakeven longrun average price necessary to continue producing a crop. This is an indicator of total costs.

Return Indicators

Net cash returns (total cash receipts less total cash expenses) are strictly cash returns and are the cash in hand to allocate to capital replacement and owned factors of production.

Net cash returns after replacement (receipts less cash expenses and replacement) reflect cash available for paying for the farmer's owned inputs after all cash costs are paid.

Residual returns to management and risk (total receipts less total economic costs) are the longrun economic indicators used to compare performance of commodities and to assess relative returns among commodities.

1986 Rice Costs and Returns

The rice budgets discussed in this workshop have been revised to incorporate the 1984 FCRS rice survey results with the regional and national 1984-86 estimates presented in tables 4-8. Costs differed little when using the production practices and other input data from either the 1979 or 1984 surveys. Much of the chemical cost that was

Table 4--Arkansas (non-Delta): Rice production costs per planted
acre, 1984-86

Item	1984	1985	1986
<u>Dollars</u>			
Cash receipts (excl. direct Gov't payments):			
Primary crop	379.02	445.69	224.13
Total	379.02	445.69	224.13
=====			
Cash expenses:			
Seed	26.75	21.78	21.78
Fertilizer	27.89	27.11	24.17
Chemicals	1.21	1.21	1.21
Custom operations	36.92	37.50	37.51
Fuel, lube, and electricity	46.28	44.70	30.95
Repairs	32.25	33.60	33.63
Hired labor	16.95	16.92	16.43
Drying	20.73	23.31	23.35
Technical services	5.28	5.28	5.28
Total variable cash expenses	214.26	211.41	194.31
General farm overhead	17.78	17.78	17.10
Taxes and insurance	11.27	12.19	12.94
Interest	45.16	31.10	27.83
Total fixed cash expenses	74.21	61.07	57.88
Total cash expenses	288.47	272.48	252.19
Receipts less cash expenses	90.55	173.21	-28.06
Capital replacement	56.15	57.84	57.74
Receipts less cash expenses and replacement	34.40	115.37	-85.80
=====			
Economic (full ownership) costs:			
Variable cash expenses	214.26	211.41	194.31
General farm overhead	17.78	17.78	17.10
Taxes and insurance	11.27	12.19	12.94
Capital replacement	56.15	57.84	57.74
Allocated returns to owned inputs:			
Return to operating capital	6.86	5.19	3.54
Return to other nonland capital	10.97	10.77	10.86
Net land rent	78.15	94.85	37.77
Unpaid labor	28.86	28.81	27.98
Total economic costs	424.30	438.84	362.24
Residual returns to management and risk	-45.28	6.85	-138.11
=====			
Harvest-period price (dollars/cwt)	8.19	8.57	4.27
Yield (cwt/planted acre)	46.28	52.01	52.49

Table 5--California: Rice production costs per planted acre, 1984-86

Item	1984	1985	1986
<u>Dollars</u>			
Cash receipts (excl. direct Gov't payments):			
Primary crop	534.86	531.88	281.08
Total	534.86	531.88	281.08
=====			
Cash expenses:			
Seed	26.56	26.56	26.56
Fertilizer	37.38	34.70	33.78
Chemicals	6.00	6.00	6.00
Custom operations	58.34	59.34	59.79
Fuel, lube, and electricity	26.82	27.02	18.52
Repairs	34.65	35.07	35.59
Hired labor	19.39	20.43	20.10
Purchased irrigation water	24.83	24.63	23.70
Drying	46.04	47.33	50.16
Technical services	8.28	8.28	8.28
Total variable cash expenses	288.29	289.36	282.47
General farm overhead	55.16	55.16	53.06
Taxes and insurance	22.28	22.49	23.50
Interest	108.99	86.75	77.64
Total fixed cash expenses	186.43	164.40	154.21
Total cash expenses	474.72	453.76	436.68
Receipts less cash expenses	60.14	78.11	-155.60
Capital replacement	62.22	62.83	63.45
Receipts less cash expenses and replacement	-2.08	15.28	-219.05
=====			
Economic (full ownership) costs:			
Variable cash expenses	288.29	289.36	282.47
General farm overhead	55.16	55.16	53.06
Taxes and insurance	22.28	22.49	23.50
Capital replacement	62.22	62.83	63.45
Allocated returns to owned inputs:			
Return to operating capital	10.05	7.88	5.60
Return to other nonland capital	12.22	11.71	12.00
Net land rent	111.15	108.45	48.78
Unpaid labor	33.02	34.79	34.21
Total economic costs	594.39	592.68	523.08
Residual returns to management and risk	-59.53	-60.80	-242.00
=====			
Harvest-period price (dollars/cwt)	7.63	7.38	3.68
Yield (cwt/planted acre)	70.10	72.07	76.38

Table 6--Gulf Coast: Rice production costs per planted acre, 1984-86

Item	1984	1985	1986
<u>Dollars</u>			
Cash receipts (excl. direct Gov't payments):			
Primary crop	371.69	384.13	210.18
Total	371.69	384.13	210.18
=====			
Cash expenses:			
Seed	25.14	26.35	26.36
Fertilizer	40.05	38.74	35.79
Chemicals	4.45	4.52	4.64
Custom operations	53.31	54.46	54.69
Fuel, lube, and electricity	32.84	31.10	20.14
Repairs	25.20	25.67	26.06
Hired labor	15.38	16.45	15.97
Purchased irrigation water	55.09	54.65	52.58
Drying	41.31	44.24	48.06
Technical services	3.40	3.40	3.32
Total variable cash expenses	296.17	299.58	287.60
General farm overhead	19.26	19.25	18.44
Taxes and insurance	9.63	10.29	11.07
Interest	44.57	33.22	29.61
Total fixed cash expenses	73.46	62.76	59.13
Total cash expenses	369.63	362.34	346.73
Receipts less cash expenses	2.06	21.79	-136.55
Capital replacement	39.80	40.57	40.98
Receipts less cash expenses and replacement	-37.74	-18.78	-177.53
=====			
Economic (full ownership) costs:			
Variable cash expenses	296.17	299.58	287.60
General farm overhead	19.26	19.25	18.44
Taxes and insurance	9.63	10.29	11.07
Capital replacement	39.80	40.57	40.98
Allocated returns to owned inputs:			
Return to operating capital	8.67	6.85	4.74
Return to other nonland capital	8.22	7.95	8.17
Net land rent	52.70	55.60	22.38
Unpaid labor	26.18	28.02	27.18
Total economic costs	460.63	468.11	420.57
Residual returns to management and risk	-88.94	-83.98	-210.39
=====			
Harvest-period price (dollars/cwt)	8.23	7.94	3.99
Yield (cwt/planted acre)	45.15	48.36	52.63

Table 7--Mississippi River Delta: Rice production costs per
planted acre, 1984-86

Item	1984	1985	1986
<u>Dollars</u>			
Cash receipts (excl. direct Gov't payments):			
Primary crop	344.73	396.26	206.40
Total	344.73	396.26	206.40
=====			
Cash expenses:			
Seed	23.48	23.48	23.48
Fertilizer	39.61	37.62	34.24
Chemicals	12.87	12.87	12.87
Custom operations	49.32	51.75	52.17
Fuel, lube, and electricity	43.98	42.41	32.80
Repairs	22.03	23.22	23.33
Hired labor	12.64	12.87	12.58
Drying	26.18	30.58	31.62
Technical services	5.54	5.54	5.54
Total variable cash expenses	235.65	240.34	228.63
General farm overhead	16.37	16.37	15.75
Taxes and insurance	10.33	11.46	12.28
Interest	41.58	28.64	25.63
Total fixed cash expenses	68.28	56.47	53.66
Total cash expenses	303.93	296.81	282.29
Receipts less cash expenses	40.80	99.45	-75.89
Capital replacement	45.11	46.93	46.98
Receipts less cash expenses and replacement	-4.31	52.52	-122.87
=====			
Economic (full ownership) costs:			
Variable cash expenses	235.65	240.34	228.63
General farm overhead	16.37	16.37	15.75
Taxes and insurance	10.33	11.46	12.28
Capital replacement	45.11	46.93	46.98
Allocated returns to owned inputs:			
Return to operating capital	6.80	5.26	3.65
Return to other nonland capital	10.03	10.09	10.25
Net land rent	47.91	51.76	22.70
Unpaid labor	21.53	21.91	21.41
Total economic costs	393.73	404.12	361.65
Residual returns to management and risk	-49.00	-7.86	-155.25
=====			
Harvest-period price (dollars/cwt)	8.03	7.90	3.98
Yield (cwt/planted acre)	42.93	50.16	51.86

Table 8--United States: Rice production costs per planted acre,
1984-86

Item	1984	1985	1986
	<u>Dollars</u>		
Cash receipts (excl. direct Gov't payments):			
Primary crop	393.22	430.71	224.65
Total	393.22	430.71	224.65
Cash expenses:			
Seed	25.51	24.21	24.14
Fertilizer	35.61	34.06	31.20
Chemicals	5.51	5.69	5.73
Custom operations	47.92	49.09	49.06
Fuel, lube, and electricity	38.72	37.57	26.67
Repairs	28.23	29.16	29.37
Hired labor	15.90	16.38	15.90
Purchased irrigation water	20.45	20.29	19.52
Drying	32.04	34.67	35.98
Technical services	5.24	5.31	5.28
Total variable cash expenses	255.13	256.43	242.85
General farm overhead	23.67	23.85	22.56
Taxes and insurance	12.26	13.15	13.88
Interest	54.02	40.02	35.28
Total fixed cash expenses	89.95	77.02	71.72
Total cash expenses	345.08	333.45	314.57
Receipts less cash expenses	48.14	97.26	-89.92
Capital replacement	49.71	51.27	51.50
Receipts less cash expenses and replacement	-1.57	45.99	-141.42
Economic (full ownership) costs:			
Variable cash expenses	255.13	256.43	242.85
General farm overhead	23.67	23.85	22.56
Taxes and insurance	12.26	13.15	13.88
Capital replacement	49.71	51.27	51.50
Allocated returns to owned inputs:			
Return to operating capital	7.88	6.09	4.19
Return to other nonland capital	10.12	9.98	10.17
Net land rent	68.86	75.88	31.63
Unpaid labor	27.07	27.90	27.08
Total economic costs	454.70	464.54	403.86
Residual returns to management and risk	-61.48	-33.83	-179.21
Harvest-period price (dollars/cwt)	8.05	8.01	4.01
Yield (cwt/planted acre)	48.87	53.78	55.98

formerly listed under "chemical expenses" is now allocated to custom operations. Also, purchased water costs have now tripled along parts of the gulf coast. Total expenses, however, are similar between surveys.

Farm legislation in 1985 had a major effect on 1986 COP receipts and returns by providing marketing loans and certificates to producers and by reducing U.S. rice prices to near the world level. The results of the legislation are considered outside the harvest-period prices used in the COP accounts and are not included in the budgets. As a result, net 1986 COP rice returns are difficult to interpret, compared with other crops.

Average 1986 yields increased 2.2 hundredweight (cwt) over 1985, causing drying costs to increase to \$36. Other fuel costs, however, fell to \$27 per acre, causing total variable expenses to go from \$256 in 1985 to \$243 in 1986. Interest expenses fell \$5 per acre, and fixed expenses totaled \$72. All cash expenses were \$315, and economic costs fell to \$404.

Costs varied widely among the areas. Cash expenses were lowest in the non-Delta area of Arkansas (the major production region). Total cash expenses were \$252 in 1986, down \$20 from 1985 (table 4). Total economic costs were \$362, down \$77 from 1985.

Costs were highest in California where cash expenses averaged \$437 per acre and economic costs, \$523. Medium/short-grain varieties predominate in California where yields are 50 percent higher than those of long-grain varieties grown in other regions. The average price for medium/short-grain rice is 10-15 percent lower, so the higher California costs are not necessarily balanced by higher receipts.

Cash costs of producing Delta (Arkansas, Mississippi, and Louisiana) rice fell \$15 to an average \$282 in 1986. Customwork was the highest single expense item, followed by fertilizer, fuels, and drying. Total economic costs fell 11 percent, averaging \$362 per planted acre.

Gulf coast cash costs were led by custom expenses (\$55) and purchased irrigation water (\$53). Drying costs were close behind at \$48. Total variable costs averaged \$288, and total fixed costs averaged \$59.

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ESTIMATION OF RICE COSTS OF PRODUCTION:
A FARM-LEVEL BUDGET GENERATOR APPROACH //

Dargan Glaze

The Farm Sector Financial Analysis Branch estimates enterprise costs of production (COP) budgets for major program commodities. A computer model, generically called a "budget generator," is used to estimate these budgets. The budget generator, which has been used by the U.S. Department of Agriculture (USDA) since the midseventies, uses average State or region level estimates of input use and prices, as well as other commodity production practice data from farm-level surveys, to estimate aggregate-level budgets. An alternative approach is being tested to use farm-level survey data to estimate the costs-of-production (COP) enterprise budgets, rather than the average estimates presently being used.

This paper presents the farm-level approach to estimating enterprise budgets and to compare and contrast the result of this approach with the cost estimates using the more aggregated budgeting procedure. The current enterprise budget generator process is briefly described and the farm-level budgeting approach is presented. The two methodologies are compared and contrasted using survey data for rice.

Current Budget Generator

The Farm Cost and Returns Survey (FCRS) is a full probability, multiframe sample survey of farm costs, returns, and production practices. Data from this survey are sorted by State, which is the lowest level of disaggregation. Input levels and production practices for rice are estimated from the final State data set. Averages for seeding rates, fertilizer use, custom operations, machinery use, and other data are determined from this State-level survey data.

Figure 1 (p. 10) illustrates the organization and flow of data through the Firm Enterprise Data System (FEDS) budget generator process.^{1/} The "budget generator" is simply a large computer program that assembles data using six major data files to calculate costs. Parameter data sets allow the input of the costs of items (such as fertilizer and fuel) that do not change by commodity within a State. Each State has its own parameter set. The budget generator uses machinery complements and equipment sets to calculate ownership and operating costs. These files contain prices and engineering coefficients for each of the major machinery items. However, machinery complements are used primarily for crops and equipment sets are used for livestock. Each type of farm has a different set of machinery and equipment in terms of items owned and operated, age, and

Glaze is an agricultural economist in the Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA.

1/ McElroy, Robert G. Major Statistical Series of the U.S. Department of Agriculture-Costs of Production, AH-671, Vol. 12, Econ. Res. Serv., U.S. Dept. Agr., Sept. 1987.

size. The irrigation complement contains descriptive data for about 400 irrigation systems used to compute irrigation costs. The lists are used for printing the final budget. The budget files consolidate the other files by indicating the appropriate machinery complement, parameter set, and other data to be used and define the production practices, times over, crop yields, and other information specific to an enterprise.

The budget generator combines all the input files to estimate State-level enterprise budgets that summarize all costs and returns associated with the production of a specific commodity. The State data are then aggregated into regions with each budget weighted according to the amount of production represented by each budget. The computer data are updated when necessary or when new survey data become available.

Alternative Budget Generator

The alternative approach uses a FORTRAN computer programming model that directly uses the FCRS data at the farm level. This approach will be referred to as the farm-level budget generator (FLBG) because it uses the farm as the lowest level of disaggregation. The FEDS, however, uses the State level as the lowest level of disaggregation.

Figure 1 below illustrates the organization and flow of data through the FLBG process. The organization is similar to the FEDS process. There are four files that provide data: FCRS data set, parameter sets, machinery complements, and equipment complements. The FLBG directly accesses the FCRS data, one observation at a time. The parameter sets, machinery complements, and equipment complements serve much the same purpose as they do with the FEDS, although these data files are more extensive to meet the additional data requirements of the FLBG. For example, instead of having an average machinery complement limited to 100 pieces of equipment, all machines reported by farmers in the FCRS are included, giving a more precise cost estimate.

The FLBG estimates an enterprise budget for each observation, thereby, using the actual farm-level data rather than State-level averages. The input levels used in the FLBG to estimate individual producer budgets are the actual input levels the producer reported.

To estimate a regional, weighted average costs of production, a data set consisting of budget data for each producer is created and then weighted by the amount of production represented by each budget. The budget data are aggregated to produce the COP enterprise budgets for regions and the United States. As with the FEDS, the FLBG can be updated to estimate new budgets as new data become available. Because there are fewer data files (four files), the updating process is simplified.

Rice--A Test Case

Rice is the first crop to be used as a test for the FLBG. Rice production in the United States is primarily located in five States (Arkansas, California, Louisiana, Mississippi, and Texas). USDA has defined four major rice production regions: (1) Mississippi River Delta (includes the Delta areas of Arkansas, Louisiana, and Mississippi), (2) Arkansas, Non-Delta (includes the Grand Prairie and Northeast Arkansas),

(3) Gulf Coast (includes Southwest Louisiana, Upper Texas Coast, and Lower Texas Coast), and (4) California.

Tables 1-4 show the results obtained using the two approaches to estimate cost per planted acre for each of the four COP regions during 1984-86. Table 5 shows the results for the United States.

Yields used by the FEDS are season averages reported by the National Agricultural Statistics Service (NASS) and crop prices are averages of harvest-month prices. Yields used in the FLBG procedure are averages based on producer survey responses, while crop prices are the same as prices used for the FEDS. Differences in cash receipts arise as a result of yield differences.

As the tables indicate, there are slight differences in the cost estimates obtained from the use of the two estimation procedures. Most of the difference can be attributed to the level of disaggregation. Because the FEDS uses State-level averages, some of the variations that exist at the farm level are removed. When the FLBG data are weighted and aggregated, more variability is retained and reflected in the aggregated budgets than with the FEDS. Most of the equations are identical between the two approaches, but farm-level variations account for much of the difference in results. However, farm-level variations do not explain all of the difference that exists.

Irrigation expenses are contained in both the fuel, lubrication and electricity expenses and repair expenses on the FEDS, but irrigation expenses, including irrigation electricity costs, are a separate budget item on the FLBG. If the fuel and lubrication expenses on the 1984

Figure 1 Farm-level budget generator (FLBG) flow diagram

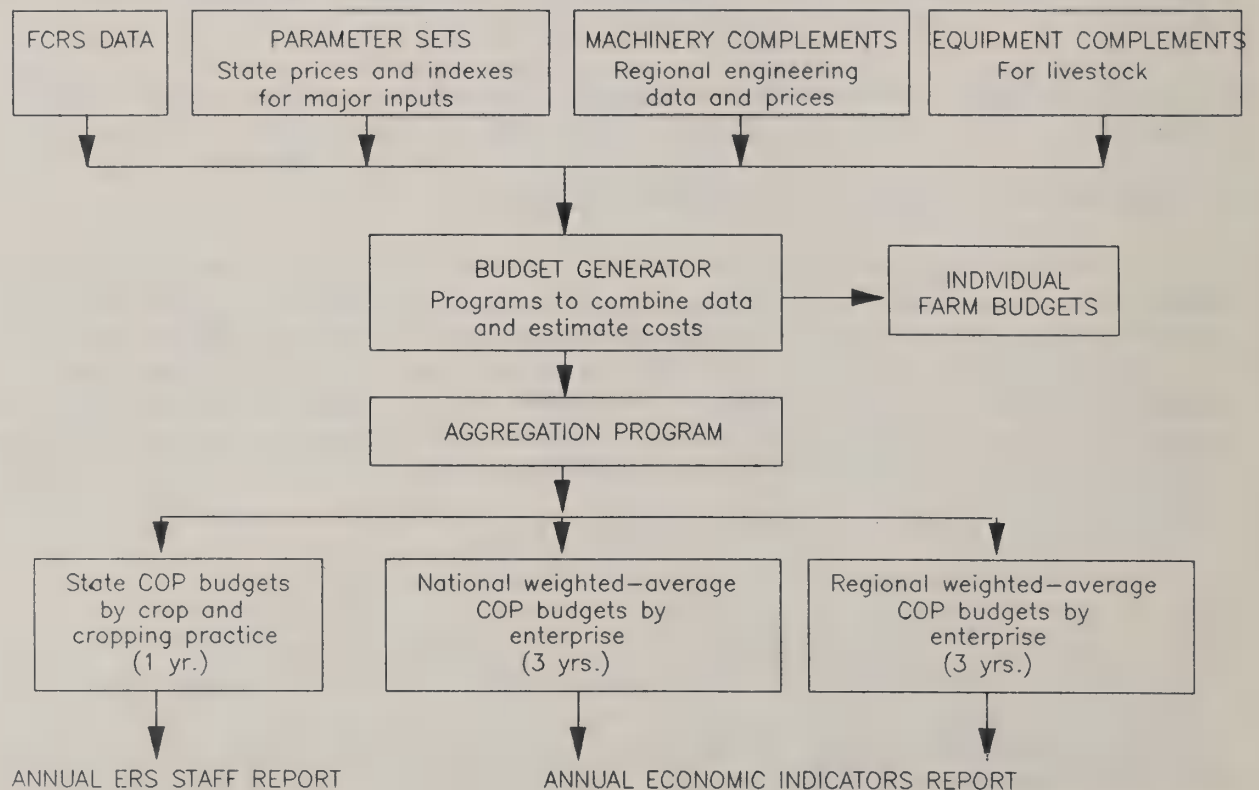


Table 1--Arkansas (non-Delta): Rice production costs per planted acre by the farm-level budget generator and the firm enterprise data system, 1984-86 1/

Item	1984		1985		1986	
	FLBG	FEDS	FLBG	FEDS	FLBG	FEDS
Dollars						
Cash receipts (excl. direct Gov't payments):						
Primary crop	404.36	379.02	423.11	445.69	210.82	224.13
Total	404.36	379.02	423.11	445.69	210.82	224.13
Cash expenses:						
Variable:						
Seed	25.03	26.75	25.03	21.78	25.03	21.78
Fertilizer	29.46	27.89	28.67	27.11	25.66	24.17
Chemicals	0.94	1.21	0.94	1.21	0.94	1.21
Custom operations	39.74	37.50	39.74	37.50	39.74	37.51
Fuel, lube, and electricity	11.32	46.28	9.92	44.70	5.68	30.95
Repairs	10.22	32.25	10.22	33.60	10.22	33.63
Drying	24.10	20.73	24.10	23.31	24.10	23.35
Technical services	3.95	5.28	4.00	5.28	3.42	5.28
Irrigation 2/	36.04	--	35.75	--	34.39	--
Hired labor	16.78	16.95	16.78	16.92	16.78	16.43
Purchased water	.55	.00	.55	.00	.55	.00
Total variable expenses	198.13	214.26	195.70	211.41	186.51	194.31
Fixed:						
General farm overhead	20.78	17.78	21.60	17.78	11.29	17.10
Taxes and insurance	7.77	11.27	8.16	12.19	8.55	12.94
Interest	54.94	45.16	57.71	31.10	29.95	27.83
Total fixed cash expenses	83.49	74.21	86.87	61.07	49.83	57.88
Capital replacement	37.79	56.15	37.71	57.84	36.94	57.74
Total cash expenses and capital replacement costs	319.41	344.62	320.28	330.32	273.24	309.93
Receipts less cash expenses and capital replacement	84.95	34.40	102.83	115.37	-62.42	-85.80
Economic (full ownership) costs:						
Variable cash expenses	198.13	214.26	195.70	211.41	186.51	194.31
General farm overhead	20.78	17.78	21.60	17.78	11.29	17.10
Taxes and insurance	7.77	11.27	8.16	12.19	8.55	12.94
Capital replacement	37.79	56.15	37.71	57.84	36.94	57.74
Allocated returns to owned inputs:						
Return to operating capital	6.48	6.86	5.00	5.19	3.66	3.54
Return to other nonland capital	12.65	10.97	13.43	10.77	12.09	10.86
Net land rent	94.79	78.15	96.77	94.85	54.90	37.77
Unpaid labor	60.76	28.86	59.90	28.81	58.03	27.98
Total economic costs	439.15	424.30	438.27	438.84	371.97	362.24
Residual returns to management and risk	-34.79	-45.28	-15.14	6.85	-161.15	-138.11
Harvest-period price (dollars/cwt)	8.19	8.19	8.57	8.57	4.27	4.27
Yield (cwt/planted acre)	49.37	46.28	49.37	52.01	49.37	52.49

-- = Not applicable.

1/ FLBG results are preliminary.

2/ Irrigation expenses are a separate line item for FLBG. In FEDS, irrigation expenses, including irrigation electricity costs, are included in both the fuel, lube, and electricity expenses and repair expenses.

Source: 1984 Farm Costs and Returns Survey.

Table 2--California: Rice production costs per planted acre by the farm-level budget generator and the firm enterprise data system, 1984-86 1/

Item	1984		1985		1986	
	FLBG	FEDS	FLBG	FEDS	FLBG	FEDS
Dollars						
Cash receipts (excl. direct Gov't payments):						
Primary crop	536.03	534.86	518.47	531.88	258.53	281.08
Total	536.03	534.86	518.47	531.88	258.53	281.08
Cash expenses:						
Variable:						
Seed	31.20	26.56	31.20	26.56	31.20	26.56
Fertilizer	43.95	37.38	41.22	34.70	40.30	33.78
Chemicals	5.95	6.00	5.95	6.00	5.95	6.00
Custom operations	75.58	58.34	75.58	59.34	75.58	59.79
Fuel, lube, and electricity	9.82	26.82	9.18	27.02	4.56	18.52
Repairs	13.19	34.65	13.19	35.07	13.19	35.59
Drying	45.38	46.04	45.38	47.33	45.38	50.16
Technical services	.95	8.28	.94	8.28	.73	8.28
Irrigation 2/	9.12	--	9.05	--	8.70	--
Hired labor	55.99	19.39	55.99	20.43	55.99	20.10
Purchased water	12.11	24.83	12.11	24.63	12.11	23.70
Total variable expenses	303.24	288.29	299.79	289.36	293.69	282.47
Fixed:						
General farm overhead	36.84	55.16	36.42	55.16	22.96	53.06
Taxes and insurance	6.62	22.28	7.10	22.49	7.56	23.50
Interest	88.02	108.99	87.07	86.75	51.44	77.64
Total fixed cash expenses	131.48	186.43	130.59	164.40	81.96	154.21
Capital replacement	34.16	62.22	34.21	62.83	33.82	63.45
Total cash expenses and capital replacement costs	468.88	536.94	464.59	516.59	409.47	500.13
Receipts less cash expenses and capital replacement	67.15	-2.08	53.88	15.28	-159.94	-219.05
Economic (full ownership) costs:						
Variable cash expenses	303.24	288.29	299.79	289.36	293.69	282.47
General farm overhead	36.84	55.16	36.42	55.16	22.96	53.06
Taxes and insurance	6.62	22.28	7.10	22.49	7.56	23.50
Capital replacement	34.16	62.22	34.21	62.49	33.82	63.45
Allocated returns to owned inputs:						
Return to operating capital	9.93	10.05	7.68	7.80	5.77	5.60
Return to other nonland capital	12.13	12.22	11.49	11.71	11.59	12.00
Net land rent	142.87	111.15	136.83	108.45	91.53	48.78
Unpaid labor	57.94	33.02	60.74	34.79	58.98	34.21
Total economic costs	603.73	594.39	594.26	592.68	526.48	523.08
Residual returns to management and risk	-67.70	-59.53	-75.79	-60.80	-267.94	-242.00
Harvest-period price (dollars/cwt)	7.63	7.63	7.38	7.38	3.68	3.68
Yield (cwt/planted acre)	70.25	70.10	70.25	72.07	70.25	76.38

-- = Not applicable.

1/ FLBG results are preliminary.

2/ Irrigation expenses are a separate line item for FLBG. In FEDS, irrigation expenses, including irrigation electricity costs, are included in both the fuel, lube, and electricity expenses and repair expenses.

Source: 1984 Farm Costs and Returns Survey.

Table 3--Gulf Coast: Rice production costs per planted acre by the farm-level budget generator and the farm enterprise data system, 1984-86 1/

Item	1984		1985		1986	
	FLBG	FEDS	FLBG	FEDS	FLBG	FEDS
Dollars						
Cash receipts (excl. direct Gov't payments):						
Primary crop	396.37	371.69	382.40	384.13	192.16	210.18
Total	396.37	371.69	382.40	384.13	192.16	210.18
Cash expenses:						
Variable:						
Seed	31.41	25.14	31.41	26.35	31.41	26.36
Fertilizer	44.45	40.05	43.13	38.74	40.24	35.79
Chemicals	4.23	4.45	4.23	4.52	4.23	4.64
Custom operations	52.62	53.31	52.62	54.46	52.62	54.69
Fuel, lube, and electricity	14.44	32.84	12.11	31.10	6.64	20.14
Repairs	12.06	25.20	12.06	25.67	12.06	26.06
Drying	39.07	41.31	39.07	44.24	39.07	48.06
Technical services	2.54	3.40	2.53	3.40	2.40	3.32
Irrigation 2/	32.94	--	32.67	--	31.44	--
Hired labor	19.17	15.38	19.17	16.45	19.17	15.97
Purchased water	16.65	55.09	16.65	54.65	16.65	52.58
Total variable expenses	269.58	296.17	265.65	299.58	255.93	287.60
Fixed:						
General farm overhead	25.50	19.26	24.92	19.25	15.39	18.44
Taxes and insurance	9.67	9.63	10.21	10.29	10.74	11.07
Interest	50.20	44.57	48.52	33.22	27.91	29.61
Total fixed cash expenses	85.37	73.46	83.65	62.76	54.04	59.13
Capital replacement	39.25	39.80	39.22	40.57	38.55	40.98
Total cash expenses and capital replacement costs	394.20	409.43	388.52	402.91	348.52	387.71
Receipts less cash expenses and capital replacement	2.17	-37.74	-6.12	-18.78	-156.36	-177.53
Economic (full ownership) costs:						
Variable cash expenses	269.58	296.17	265.65	299.58	255.93	287.60
General farm overhead	25.50	19.26	24.92	19.25	15.39	18.44
Taxes and insurance	9.67	9.63	10.21	10.29	10.74	11.07
Capital replacement	39.25	39.80	39.22	40.57	38.55	40.98
Allocated returns to owned inputs:						
Return to operating capital	8.85	8.67	6.82	6.85	4.79	4.74
Return to other nonland capital	7.94	8.22	7.52	7.95	7.59	8.17
Net land rent	82.20	52.70	80.03	55.60	46.60	22.38
Unpaid labor	81.28	26.18	86.32	28.02	82.86	27.18
Total economic costs	524.27	460.63	520.69	468.11	462.45	420.57
Residual returns to management and risk	-127.90	-88.94	-138.29	-83.98	-270.29	-210.39
Harvest-period price (dollars/cwt)	8.23	8.23	7.94	7.94	3.99	3.99
Yield (cwt/planted acre)	48.16	45.15	48.16	48.36	48.16	52.63

-- = Not applicable.

1/ FLBG results are preliminary.

2/ Irrigation expenses are a separate line item for FLBG. In FEDS, irrigation expenses, including irrigation electricity costs, are included in both the fuel, lube, and electricity expenses and repair expenses.

Source: 1984 Farm Costs and Returns Survey.

Table 4--Mississippi River Delta: Rice production costs per planted acre by the farm-level budget generator and the firm enterprise data system, 1984-86 ^{1/}

Item	1984		1985		1986	
	FLBG	FEDS	FLBG	FEDS	FLBG	FEDS
Dollars						
Cash receipts (excl. direct Gov't payments):						
Primary crop	361.00	344.73	355.15	396.26	178.93	206.40
Total	361.00	344.73	355.15	396.26	178.93	206.40
Cash expenses:						
Variable:						
Seed	28.89	23.48	29.89	23.48	28.89	23.48
Fertilizer	39.20	39.61	37.75	37.62	33.92	34.24
Chemicals	12.45	12.87	12.45	12.87	12.45	12.87
Custom operations	40.39	49.32	40.39	51.75	40.39	52.17
Fuel, lube, and electricity	8.21	43.98	6.98	42.41	3.86	32.80
Repairs	10.68	22.03	10.71	23.22	10.71	23.33
Drying	33.23	26.18	33.23	30.58	33.23	31.62
Technical services	3.57	5.54	3.56	5.54	2.89	5.54
Irrigation ^{2/}	23.87	--	23.68	--	22.78	--
Hired labor	19.81	12.64	19.81	12.87	19.81	12.58
Purchased water	.09	.00	.09	.00	.09	.00
Total variable expenses	220.39	235.65	217.54	240.34	209.02	228.63
Fixed:						
General farm overhead	20.98	16.37	21.03	16.37	12.02	15.75
Taxes and insurance	6.07	10.33	6.37	11.46	6.66	12.28
Interest	48.50	41.58	48.64	28.64	27.32	25.63
Total fixed cash expenses	75.55	68.28	76.04	56.47	46.00	53.66
Capital replacement	34.51	45.11	34.46	46.93	33.79	46.98
Total cash expenses and capital replacement costs	330.45	349.04	328.04	343.74	288.81	329.27
Receipts less cash expenses and capital replacement	30.55	-4.31	27.11	52.52	-109.88	-122.87
Economic (full ownership) costs:						
Variable cash expenses	220.39	235.65	217.54	240.34	209.02	228.63
General farm overhead	20.98	16.37	21.03	16.37	12.02	15.75
Taxes and insurance	6.07	10.33	6.37	11.46	6.66	12.28
Capital replacement	34.51	45.11	34.46	46.93	33.79	46.98
Allocated returns to owned inputs:						
Return to operating capital	7.20	6.80	5.56	5.26	4.07	3.65
Return to other nonland capital	10.28	10.03	10.17	10.09	9.83	10.25
Net land rent	74.88	47.91	68.96	51.76	54.99	22.70
Unpaid labor	38.71	21.53	38.16	21.91	36.97	21.41
Total economic costs	413.02	393.73	402.25	404.12	367.35	361.65
Residual returns to management and risk	-52.02	-49.00	-47.10	-7.86	-188.42	-155.25
Harvest-period price (dollars/cwt)	8.03	8.03	7.90	7.90	3.98	3.98
Yield (cwt/planted acre)	44.96	42.93	44.96	50.16	44.96	51.86

-- = Not applicable.

1/ FLBG results are preliminary.

2/ Irrigation expenses are a separate line item for FLBG. In FEDS, irrigation expenses, including irrigation electricity costs, are included in both the fuel, lube, and electricity expenses and repair expenses.

Source: 1984 Farm Costs and Returns Survey.

Table 5--United States: Rice production costs per planted acre by the farm-level budget generator and the firm enterprise data system, 1984-86 ^{1/}

Item	1984			1985		1986	
	FLBG	FLBG ^{2/}	FEDS	FLBG	FEDS	FLBG	FEDS
Dollars							
Cash receipts (excl. direct Gov't payments):							
Primary crop	409.43	409.43	393.22	407.40	430.71	203.95	224.65
Total	409.43	409.43	393.22	407.40	430.71	203.95	224.65
Cash expenses:							
Variable:							
Seed	28.39	28.39	25.51	28.39	24.21	28.39	24.14
Fertilizer	37.52	37.52	35.61	36.18	34.06	33.30	31.20
Chemicals	5.06	5.06	5.51	5.06	5.69	5.06	5.73
Custom operations	48.06	48.06	47.92	48.06	49.09	48.06	49.06
Fuel, lube, and electricity	11.24	11.24	38.72	9.73	37.57	5.37	26.67
Repairs	11.20	11.20	28.23	11.21	29.16	11.21	29.37
Drying	32.93	32.93	32.04	32.93	34.67	32.93	35.98
Technical services	3.09	3.09	5.24	3.11	5.31	2.67	5.28
Irrigation ^{3/}	28.88	28.88	--	28.65	--	27.57	--
Hired labor	23.34	23.34	15.90	23.34	16.38	23.34	15.90
Purchased water	6.21	6.21	20.45	6.21	20.29	6.21	19.52
Total variable expenses	235.92	235.92	255.13	232.87	256.43	224.11	242.85
Fixed:							
General farm overhead	24.21	24.21	23.67	24.33	23.85	14.09	22.56
Taxes and insurance	7.73	7.73	12.26	8.15	13.15	8.57	13.88
Interest	56.68	56.68	54.02	56.97	40.02	31.70	35.28
Total fixed cash expenses	88.62	88.62	89.95	89.45	77.02	54.36	71.72
Capital replacement	36.95	41.53	49.71	36.91	51.27	36.24	51.50
Total cash expenses and capital replacement costs	361.49	366.07	394.79	359.23	384.27	314.71	366.07
Receipts less cash expenses and capital replacement	47.94	43.36	-1.57	48.17	45.99	-110.76	-141.42
Economic (full ownership) costs:							
Variable cash expenses	235.92	235.92	255.13	232.87	256.43	224.11	242.85
General farm overhead	24.21	24.21	23.67	24.33	23.85	14.09	22.56
Taxes and insurance	7.73	7.73	12.26	8.15	13.15	8.57	13.88
Capital replacement	36.95	41.53	49.71	36.91	51.27	36.24	51.50
Allocated returns to owned inputs:							
Return to operating capital	7.73	7.73	7.88	5.97	6.09	4.33	4.19
Return to other nonland capital	10.81	10.81	10.12	10.89	9.98	10.33	10.17
Net land rent	93.46	93.46	68.86	92.46	75.88	57.65	31.63
Unpaid labor	60.81	60.81	27.07	62.05	27.90	59.93	27.08
Total economic costs	477.62	482.20	454.70	473.63	464.54	415.25	403.86
Residual returns to management and risk	-68.19	-72.77	-61.48	-66.23	-33.83	-211.30	-179.21
Harvest-period price (dollars/cwt)	8.05	8.05	8.05	8.01	8.01	4.01	4.01
Yield (cwt/planted acre)	50.86	50.86	48.87	50.86	53.78	50.86	55.98

-- = Not applicable.

^{1/} FLBG results are preliminary.

^{2/} FLBG adjusted for capital replacement difference.

^{3/} Irrigation expenses are a separate line item for FLBG. In FEDS, irrigation expenses, including irrigation electricity costs, are included in both the fuel, lube, and electricity expenses and repair expenses.

Source: 1984 Farm Costs and Returns Survey.

FLBG are combined with the repair expense and irrigation expenses, the FLBG estimate of \$51.32 can be compared with the FEDS estimate of \$66.95 in table 5.

Another procedural difference affecting the budget results is the allocation of certain farm-level whole farm costs to the rice enterprise. The costs are allocated to the rice enterprise by prorating the total cost for the farm by the ratio of the value of rice production to the value of total production to estimate the rice component of that cost. This procedure was used for labor (hired and unpaid), general farm overhead, and cash interest payments.

The most important difference between the two budget generators is the estimation of machinery use. This difference is reflected in variable expenses through fuel, lubrication, and repair expenses, as well as in fixed expenses through tax and insurance expenses and capital replacement costs. The difference between the two approaches occurs as a result of the machinery complements used to estimate the machinery-related budget items.

The FEDS used a machinery complement based on State-level averages of commonly used equipment, while the FLBG uses a machinery complement based on the pieces of equipment the producer actually used. When the survey data are analyzed for use in creating the FEDS machinery complement, there is a limit of 100 machines so only the most commonly used machines are included. Less common machines are accounted for by including their "times-over" requirements with the more common machines. While all labor is accounted for, machinery costs are priced at the level of the more common, and often more costly, machines.

The reason FEDS includes some machines and excludes others is that the computer model is designed to handle only 100 machines at a time in the machinery complement. Because the FLBG does not limit the number of machinery items that can be used, smaller and older machines, which tend to have lower costs, are included in the survey.

The calculation of capital replacement costs does differ between the FEDS and FLBG. The FEDS estimates capital replacement costs based on the average age for the machinery, while the FLBG uses the total useful life. This is why the machinery-related items, such as capital replacement costs, are lower (\$36.95 1984 FLBG versus \$49.71 1984 FEDS) (table 5). For example, the annual replacement cost for a specific piece of equipment, such as a field cultivator (24 ft) in the Gulf Coast region is \$3.12 using the FLBG and \$6.24 using the FEDS. The difference is the result of dividing the purchase price less salvage by the manufacturer's estimate of hours of useful life (FLBG) or by the product of the hours of annual use multiplied by the years of assumed useful life (FEDS).

Table 5 also shows the results of incorporating the FEDS method of calculating capital replacement costs into the FLBG model for 1984. The new estimated budget is adjusted for capital replacement differences. The capital replacement cost of \$41.53 can be compared directly with the capital replacement cost of \$49.71 from the FEDS. The difference between the two is the result of the different pieces of machinery used in the machinery complements.

Summary

The major difference between the FEDS and FLBG is the level of disaggregation. Because the FEDS uses the State level as the lowest level of disaggregation, State-level averages are used to estimate COP enterprise budgets. The alternative approach, FLBG, uses the farm level as the lowest level of disaggregation. The FLBG estimates an enterprise budget for each farm observation of the survey, which is weighted and aggregated to estimate the COP enterprise budgets.

Enterprise budgets estimated from farm-level data should provide more accurate estimates of production costs than those estimated from averages at a higher level of disaggregation. The State-level averages used by the FEDS removes some of the variation that exists in the farm-level data. Even though most of the equations used to calculate budget items are identical, the variability in the data is reflected by the differences in the budget results shown in the tables.

Another difference between the two approaches is machinery use. The FEDS used a machinery complement based on State-level averages of commonly used equipment, which overstates the expenses related to machinery use, such as capital replacement cost. The FLBG used a machinery complement based on what the producer uses.

There are advantages and disadvantages with both approaches. The major advantage of the FLBG is that it enables us to use farm-level survey data to conduct a more detailed analysis of production practices, input use, and prices. Although the results of the FLBG are similar to that of the FEDS, the FLBG must still be more thoroughly evaluated to determine if it can be used to replace the current budget generator.

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ECONOMICS OF SIZE FOR U.S. RICE FARMS
BY FARM SIZE, 1984

Michael Salassi

One of the major areas of discussion in farm financial analysis centers around the level of production costs for different sizes of farms. Costs of producing a particular commodity are generally assumed to be lower, on a per unit basis, on larger farms than on smaller farms. However, many factors influence the level of costs on a particular farm. Farm size, degree of specialization, machinery and equipment investment, farm debt structure, and managerial ability all play a significant role in determining the level of commodity production costs.

This paper provides some information on production cost differences by size of farm relative to U.S. rice production. Average rice production costs are estimated for different sizes of rice farms in the United States, as well as individual production regions. Data from the 1984 Farm Costs and Returns Survey (FCRS) are used along with a farm-level budget generator to estimate rice production costs. In the first section of this paper, factors that influence the level of production costs for different sizes of farms are discussed. Next, procedures used to estimate the production costs are presented, followed by estimates of 1984 rice production costs by region and size of farm. Finally, structural and financial characteristics of rice farms from the 1984 FCRS are used to provide some explanation for differences in cost levels for various farm sizes.

Economies of Size

Economies or diseconomies of size exist when the per-unit production cost of a particular commodity changes as farm size changes. When production costs per unit decline (increase) as farm size increases, economies (diseconomies) of size are said to exist. It is generally assumed that for most agricultural commodities per unit production costs are lower for larger farms than for smaller farms.

Economies of size exist as a result of two primary factors. Technical economies result in lower costs per unit because of division and specialization of labor, more efficient use of machinery and equipment, and more efficient management and production practices. Examples of technical economies include the use of eight-row rather than six-row equipment, resulting in less machine and labor hours per acre, or hiring labor to perform specialized tasks (such as monitoring irrigation water) to improve efficiency.

Pecuniary economies result in lower production costs per unit because of lower per unit input prices paid as a result of bulk purchases. Larger farms may, for example, receive a volume discount on large purchases of

Salassi is an agricultural economist in the Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA.

fuel or fertilizer. Pecuniary economies may also result from premiums received on commodity sales because of volume or other factors.

Since economies of size assume that plant or farm size can change because resources are not constrained, it is a longrun concept. Economies and diseconomies of size are illustrated by a U-shaped longrun average cost (LRAC) curve. The LRAC is the "envelope" curve that is tangent to each shortrun average cost (SRAC) curve at the point where the level of output for a given plant size is the most efficient.

Methodology

There are three general classifications of analytical techniques used to measure economies of size: (1) economic engineering or synthetic firm approach, (2) census data analysis and survivorship technique, and (3) cross-sectional analysis from actual firm data. This last classification can be further divided into three subcategories: (1) direct analysis of actual firm records, (2) composite firm budgets from actual firm records, and (3) standardized or adjusted data from actual firms.^{1/}

The synthetic firm approach analyzes technical economies of size in a static framework, but pecuniary economies are often ignored. This approach is useful to show potential or theoretical economies of size and efficiencies. The use of census data to analyze economies of size is often undertaken to identify the most efficient size group and to analyze structural change. This approach assumes that only the most efficient firm can compete in the long run and ignores movement of firms into and out of a size group for reasons other than competitiveness.

Cross-sectional analysis using standardized data from actual farms is the approach used in this study. This approach provides some insight into both technical and pecuniary economies of size. The major criticism of this methodology is that cost data obtained from actual farms may not contain technical efficiencies. The procedure does not provide the opportunity to analyze size classifications from an efficiency perspective, but it does provide insight concerning the real world efficiency of resource allocation.^{2/} For this reason, this study does not deal with economies of size in the traditional sense, instead it deals with the "economics of size."

The term "economics of size" is used to describe the analysis of size relationships without determination of efficiency or optimality. Even though the concept of economies of size is an explanation of cost

^{1/} Madden, J. Patrick. Economies of Size in Farming: Theory, Analytical Procedures and a Review of Selected Studies, AER-107, Econ. Res. Serv., U.S. Dept. Agr., Feb. 1967. Miller, Thomas A. "Economics of Size, Structural Change, and the Impact of a Family Farm Policy," paper presented at the Western Agricultural Economics Association Annual Meeting, Las Cruces, NM, July 21-22, 1980.

^{2/} "Economics of Size, Structural Change, and the Impact of a Family Farm Policy," and Smith, E.G., J.W. Richardson, and R.D. Knutson. Cost and Pecuniary Economies in Cotton Production and Marketing: A Study of Texas Southern High Plains Cotton Producers, Texas Agricultural Experiment Station Bulletin 1475, Texas A&M Univ., College Station, Aug. 1984.

differences by size, the methodology used does not necessarily provide optimal or efficient input use or production practices. The emphasis of economics of size work is to analyze size classifications through the use of farm characteristics and the attributes associated with various farm classifications within an economic framework.

The study area consists of the five States (Arkansas, California, Louisiana, Mississippi, and Texas) where rice production is primarily located. USDA has defined four major rice production regions: (1) Mississippi River Delta (includes the Delta areas of Arkansas, Louisiana, and Mississippi), (2) Arkansas, non-Delta (includes the Grand Prairie and Northeast Arkansas), (3) Gulf Coast (includes Southwest Louisiana, Upper Texas Coast, and Lower Texas Coast), and (4) California.

The FCRS is a full probability, multiframe sample survey of farm costs, returns, and production practices across the United States for crop and livestock commodities. Enterprise budgets are estimated using FCRS data with the Firm Enterprise Data System (FEDS). The FEDS, which has been used by the U.S. Department of Agriculture (USDA) since the midseventies, uses State-level averages of input use in estimating enterprise production cost budgets.^{3/} The approach used for this study utilizes a farm-level budget generator (FLBG) to estimate cost budgets for alternative size classes.

The advantage of using FLBG is that much of the variability and descriptive information associated with farm businesses is retained by using the farm level as the level of disaggregation. Characteristics of individual farms are more accurately reflected in the enterprise budget estimates. In addition, pecuniary economies are better captured using this procedure, although some individual input prices are not obtained in the survey and must be incorporated through the budget generator.

The 1984 FCRS data for rice are used to analyze farm-size classifications. Average yields are based on producer survey responses, while crop prices are averages of harvest-month prices for each region. Survey observations were divided into three farm-size groupings of 1,000 acres or less, 1,001-2,000 acres, and 2,001 acres or more. Frequency distributions were used to determine the number of farms within a specific acreage category. These particular acreage categories were chosen so that there were enough sample observations in each group to provide accurate estimates of rice production costs by farm size.

Cost Differences by Farm Size

Estimated average rice cost-of-production budgets for 1984 are presented in tables 1-10 by farm size for the United States and each of the four rice production regions. Costs were estimated on a per planted acre and per hundredweight (cwt) basis. Receipts were based on the average yield per planted acre within each size group and the average national or regional harvest-period price.

^{3/} McElroy, Robert G. Major Statistical Series of the U.S. Department of Agriculture: Costs of Production, AH-671, Vol. 12, Econ. Res. Serv., U.S. Dept. Agr., Sept. 1987.

Two groups of cost and return measures are important in analyzing the cost structure of a particular farm size. Total cash expenses are the out-of-pocket costs incurred during the production process. Receipts, less cash expenses, give an indication of the relative cashflow position of the farm, with respect to an individual enterprise. Economic costs include variable cash expenses, general farm overhead, taxes and insurance, and capital replacement and also account for the opportunity costs associated with the use of owned inputs. These opportunity costs include allocated returns for the use of operating and other nonland capital, land, and unpaid labor.^{4/} Cash receipts, less total economic costs, are defined as the residual returns to management and risk and can be interpreted as the return to the operator's management and risk after all costs associated with the production of that particular enterprise have been accounted for.

Average rice costs of production per acre by size of farm for the United States in 1984 are shown in table 1. Rice farms of 1,001-2,000 acres in size had the lowest estimated costs with average cash expenses of \$299 per acre and average economic costs of \$469 per acre. Total cash expenses averaged \$326 per acre on farms of 1,000 acres or less and \$347 per acre on farms greater than 2,000 acres. Total economic costs on these farms averaged \$486 per acre and \$476 per acre, respectively. Receipts, less cash expenses, were highest on farms of 2,000 acres or less at about \$92 per acre and declined to about \$70 per acre on larger farms. Residual returns to management and risk were approximately \$8 to \$18 per acre higher on the largest farms, primarily because of lower per acre charges for the use of nonland capital and unpaid labor.

Production costs per hundredweight (cwt) for U.S. rice farms by farm size are presented in table 2. Farms of 1,000 acres or less and farms greater than 2,000 acres reported the highest average rice yields at approximately 51.9 cwt per planted acre. Rice farms of 1,001-2,000 acres reported average yields of 48.6 cwt per acre. On a per cwt basis, average total cash expenses were estimated to be \$6.27 on small farms, \$6.15 on mid-sized farms, and \$6.70 on large farms. Total economic costs, however, were lowest for farms greater than 2,000 acres at \$9.20 per cwt, compared with \$9.36 and \$9.65 per cwt on smaller farms. Although receipts, less cash expenses, were less for the largest rice farms, lower total economic costs resulted in higher returns to management and risk relative to smaller farms.

The largest rice farms in the Mississippi River Delta had the lowest estimated production costs per acre. Total cash expenses averaged \$278 per acre on these large farms (table 3). Smaller rice farms had total cash expenses in excess of \$300 per acre. Economic costs on large farms were estimated to be about \$396 per acre, compared with \$445 per acre on

^{4/} Charges for operating capital use a 6-month U.S. Treasury bill rate. Nonland capital costs are estimated as the value of nonland assets used in rice production multiplied by the rate of return on production assets. Net land rent represents a composite cash/share rental value and is estimated by taking the per-acre cash rental rate and the per-acre share rental rate (less real estate taxes) from survey data and weighting each by its share of total acreage rented. The value of unpaid labor is allocated to the rice enterprise based upon rice sales as a percentage of total farm sales.

small farms and \$431 per acre on mid-sized farms. Lower average costs per acre and relatively higher yields resulted in significantly higher returns for rice farms in excess of 2,000 acres in size on both a cash cost and economic cost basis.

Cash expenses per cwt increased from \$7.37 for small farms to \$7.55 for mid-sized rice farms (table 4). Large rice farms had estimated cash expenses of \$5.99 per cwt. Total economic costs declined as farm size increased, ranging from \$10.34 per cwt on small farms to \$8.53 on large farms. Receipts, less cash expenses, were less than \$1.00 per cwt on small and mid-sized farms and over \$2.00 on large farms.

Mid-sized farms in the non-Delta region of Arkansas had the lowest average expenses per acre associated with rice production. Total cash expenses on these farms were estimated to be \$238 per acre, compared with \$307 per acre on farms with 1,000 acres or less and \$314 per acre on farms with more than 2,000 acres (table 5). This relatively large difference in cash expenses per acre also resulted in lower total economic costs per acre for mid-sized farms. Despite reporting lower average yields, receipts, less cash expenses, were highest on mid-sized farms, averaging approximately \$48 per acre higher than on small farms and \$59 per acre higher than on large farms. Returns to management and risk were approximately \$50 per acre higher on farms up to 2,000 acres, primarily due to lower variable cash expenses per acre.

Total cash expenses for rice production in the non-Delta region of Arkansas averaged \$6.09 per cwt on farms of 1,000 acres or less, \$4.97 per cwt on farms of 1,001-2,000 acres, and \$6.29 per cwt on farms of greater than 2,000 acres (table 6). Economic costs per cwt for small and mid-sized farms, however, were approximately the same, at about \$8.73 and increased to \$9.69 on the largest farms. Receipts, less cash expenses, were about \$1.00 per cwt higher on farms of 1,001-2,000 acres, compared with the other two farm-size classes.

Average cash expenses per planted acre increased with farm size on Gulf Coast rice farms. Total cash expenses ranged from \$316 per acre on small rice farms to \$398 per acre on large rice farms (table 7). Total economic costs were estimated to be \$512 per acre on farms of 1,000 acres or less and about \$530 per acre for larger farms. Smaller rice farms tended to have higher average receipts (less cash expenses) with an estimated \$66 per acre, compared with less than \$30 per acre for larger farms. Returns to management and risk, however, were greatest on the largest farms.

Cash expenses per cwt were lowest on Gulf Coast rice farms of 1,000 acres or less. Average total cash expenses on these farms were estimated to be \$6.81 per cwt (table 8). Cash expenses averaged \$7.62 and \$7.74 per cwt in the two larger farm-size classes. Farms greater than 2,000 acres had the lowest average total economic costs per cwt because of lower per acre opportunity costs for the use of owned inputs. Receipts, less cash expenses, declined as farm size increased from \$1.43 per cwt on the smallest farms to \$0.49 per cwt on the largest farms.

Rice farms in California had estimated cash production expenses in excess of \$400 per planted acre for all size classes (table 9). Average estimates of total cash expenses ranged from \$406 per acre on farms up to

1,000 acres to \$474 per acre on farms greater than 2,000 acres. Although total economic costs increased on mid-sized farms over small farms, the lowest estimates were observed on the largest farms, averaging \$577 per acre. Receipts, less cash expenses, from rice production declined for larger farms because of higher average expenses and lower average yields. Returns to management and risk, after all economic costs were charged, were highest on farms greater than 2,000 acres in size.

Total cash expenses per cwt of rice were estimated to be \$5.64 on small farms, \$6.05 on mid-sized farms, and \$6.92 on large farms (table 10). Economic costs were approximately the same for small and large farms, around \$8.40 per cwt. Total economic costs for mid-sized rice farms were estimated to be \$9.18 per cwt. Receipts above total cash expenses per cwt declined for larger farms. Returns to management and risk were highest for small and large rice farms with slightly higher average estimates for the larger farms.

Characteristics of Rice Farms by Farm Size

Characteristics of rice farms in 1984 were estimated for each of the three farm-size classes from FCRS data. Average land use and tenure on rice farms are presented, followed by characteristics specific to the rice enterprise, including degree of specialization in rice production, average yields, and seeding and fertilization rates. Financial characteristics, including farm assets and debt as well as total income and expenses associated with all crop and livestock enterprises produced on the farm, are presented on a per farm and per acre of total land operated basis. Average number and size of tractors on rice farms are also included, along with information on field implements commonly used in rice production.

Average land use and tenure on rice farms in the United States and in each major production region by farm-size class are shown in tables 11-15. U.S. rice farms in the smallest size class averaged 585 acres (153 acres owned and 439 acres rented) and ranged from an average of 425 total acres operated in California to 699 total acres operated in the Mississippi River Delta. Farms in the largest size class had average total farm acreages exceeding 4,000 acres for all rice-producing regions, except the non-Delta region of Arkansas where the largest rice farms averaged just under 3,000 acres. In the Mississippi River Delta, Arkansas (non-Delta), and Gulf Coast regions, rice was primarily grown in rotation with soybeans. Average soybean acreage per farm exceeded average rice acreage for all farm-size classes in the Mississippi River Delta and Arkansas (non-Delta) regions. Average rice and soybean acreages per farm were approximately equal on farms in the Gulf Coast region. California farms tended to produce primarily rice with smaller average acreages of other crops.

Smaller farms tended to specialize more in rice production than larger farms (tables 16-20). Rice acreage as a percentage of total farm acreage was highest on farms of 1,000 acres or less in each production region. Across all farm sizes, farms in California had the highest estimated degree of specialization in rice production (table 20) and farms in the Mississippi River Delta had the lowest (table 17).

Average rice seeding rates on farms in each region are shown in table 21. Farms of 1,000 acres or less in the Mississippi River Delta region tended to seed rice fields at an average rate of 163 pounds per acre, 27 pounds more than mid-sized farms and 7 pounds more than large farms. Rice farms in the Gulf Coast region with 2,000 acres or more reported rice seeding rates 64 pounds per acre higher than smaller farms. Seeding rates in California were about 10 pounds per acre higher on farms greater than 1,000 acres compared with smaller farms. Arkansas (non-Delta) farms reported average seeding rates about the same for all sizes of farms.

Fertilization rates on rice fields were about the same for the three farm-size groups across all U.S. farms, but varied within each region (table 22). Farms in the largest size class applied the most nitrogen to rice fields in the non-Delta region of Arkansas and the Gulf Coast with average rates of 144 pounds and 119 pounds per acre, respectively. Phosphate was applied in large quantities on rice farms in the California and Gulf Coast regions.

Farms assets, debt, and net worth on rice farms as of January 1, 1985, are shown in tables 23-27. Farms greater than 2,000 acres had lower average debt/asset ratios than smaller farms in the Mississippi River Delta and Arkansas (non-Delta) regions but had high average debt/asset ratios in the Gulf Coast and California. Total farm machinery investment per acre generally declined for larger farms. U.S. machinery investment averaged \$184 per acre on small farms, \$109 per acre on mid-sized farms, and \$101 per acre on large farms (table 23). Rice farms in California reported the highest average values of total farm machinery investment per acre, ranging from \$384 on farms of 1,000 acres or less to \$128 on farms greater than 2,000 acres (table 27).

On a whole-farm basis, mid-sized rice farms in the United States were more profitable in 1984. With gross farm income of \$192 per acre and total operating expenses of \$139 per acre, U.S. rice farms in the 1,001-to-2,000-acre class reported average net farm income of \$52 per acre (table 28). Interest payments per acre were approximately twice as large for the other two farm-size groups, and operating expenses were also higher. California rice farms reported the highest levels of total farm operating expenses, less interest, with estimates of \$317 per acre on small farms and \$235 per acre on large farms (table 32). This region also reported the highest levels of interest expense ranging from \$38 to \$63 per acre. Interest expense per acre generally tended to be lower on mid-sized rice farms, compared with smaller- or larger-sized farms, except in the Gulf Coast region where interest expense per acre was about the same for all size groups (table 31).

Tables 33 presents information on tractors commonly used in rice production within each region. The average number and size of tractors used across farm-size groups were very similar in the Mississippi River Delta, Arkansas (non-Delta), and Gulf Coast areas (table 33). Larger farms generally tended to use a larger number of tractors in connection with their rice enterprise. Although larger farms used more four-wheel drive tractors than smaller farms, two-wheel drive tractors were the most common type of tractor used in these regions. Crawler-type tractors were the most common type of tractor used on rice farms in California.

Implements listed in tables 34-37 represent the most common specific pieces of field equipment used by rice farms in each farm size group. Although different implements may be used by different farms to perform the same field operation, some useful comparisons between farm size groups can be made. For example, rice farms in the Mississippi River Delta with greater than 2,000 acres tended to use a tandem disk less times over fields than smaller farms. Rice farms greater than 1,000 acres in size used levee plows less often than smaller farms. In the non-Delta region of Arkansas, larger farms also disked rice fields less often than smaller farms but used levee plows more often. Rice farms in each size group within a production region generally used the same type of implement in producing rice, although the percentage of rice acreage over which each implement was used varied from one farm size group to another.

Summary

This paper has presented estimates of 1984 rice costs of production as well as average structural and financial characteristics of different sizes of rice farms in major production regions. Production costs were estimated using a procedure that calculates rice enterprise cost budgets for individual survey farms using each farm's reported input use and machinery complement obtained from the 1984 FCRS. Weighted average cost budgets were then estimated for the United States as well as each production region by farm size. This approach differs from more traditional budget generator techniques that use average input uses and machinery complements to estimate cost of production budgets for a given State or region.

Estimated production costs per cwt were found to be substantially the same from one farm size group to another in the United States. Total cash expenses ranged from \$6.15 per cwt on farms of 1,001-2,000 acres to \$6.70 per cwt on farms greater than 2,000 acres. Total economic costs were estimated to be \$9.36 per cwt on small farms, \$9.65 per cwt on midsized farms, and \$9.20 per cwt on large farms.

Average cost levels by size of farm varied from region to region. Larger farms in the Mississippi River Delta and Arkansas (non-Delta) appeared to have somewhat lower costs per cwt than smaller farms, although the direction of change in average costs was not consistent across all three size groups. Average total cash expenses in the Gulf Coast and California tended to increase as farm size increased. Total economic costs per cwt were lowest for rice farms with more than 2,000 acres in size in every region except the non-Delta of Arkansas where little difference in economic costs per cwt was observed across the three groups.

Table 1--United States: Average rice production costs
per planted acre by farm size class, 1984

	Farm size class		
	1-1000 Dollars	1001-2000 Dollars	2001+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	418.13	391.36	416.41
Total	418.13	391.36	416.41
Cash expenses:			
Variable:			
Seed	26.88	26.58	31.69
Fertilizer	36.74	41.29	34.93
Chemicals	1.76	4.74	8.94
Custom operations	48.87	47.23	47.96
Fuel and lube	11.87	11.42	10.39
Repairs	10.73	10.68	12.20
Drying	30.77	29.99	37.94
Technical services	2.98	2.95	3.35
Irrigation	31.29	30.16	25.11
Hired labor	20.00	18.04	31.81
Purchased water	7.58	3.05	7.61
Total variable expenses	229.47	226.13	251.93
Fixed:			
General farm overhead	26.08	22.27	23.95
Taxes and insurance	8.60	7.28	7.20
Interest (real estate)	22.75	14.61	29.35
Interest (nonreal estate)	38.91	28.53	34.24
Total fixed expenses	96.34	72.69	94.74
Total cash expenses	325.81	298.82	346.67
Receipts less cash expenses	92.32	92.54	69.74
Capital replacement	36.41	37.62	36.93
Total expenses and replacement costs			
excl. real estate interest	339.47	321.83	354.25
Total expenses and replacement costs	362.22	336.44	383.60
Receipts less cash expenses and capital replacement costs	55.91	54.92	32.81
Economic (full ownership) costs:			
Variable expenses	229.47	226.13	251.93
General farm overhead	26.08	22.27	23.95
Taxes and insurance	8.60	7.28	7.20
Capital replacement	36.41	37.62	36.93
Allocated returns to owned inputs:			
Return to operating capital	7.51	7.39	8.27
Return to other nonland capital	14.44	11.97	5.81
Net land rent	95.48	94.89	89.97
Unpaid labor	68.34	61.42	52.05
Total economic costs	486.33	468.97	476.11
Residual returns to management and risk	-68.20	-77.61	-59.70
Harvest-period price (dollars/cwt)	8.05	8.05	8.05
Yield (cwt/planted acre)	51.94	48.62	51.73

Table 2--United States: Average rice production costs
per hundredweight by farm size class, 1984 1/

	Farm size class		
	1-1000 Dollars	1001-2000 Dollars	2001+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	8.05	8.05	8.05
Total	8.05	8.05	8.05
Cash expenses:			
Variable:			
Seed	.52	.55	.61
Fertilizer	.71	.85	.67
Chemicals	.03	.10	.17
Custom operations	.94	.97	.93
Fuel and lube	.23	.23	.20
Repairs	.21	.22	.24
Drying	.59	.62	.73
Technical services	.06	.06	.06
Irrigation	.60	.62	.48
Hired labor	.39	.37	.61
Purchased water	.15	.06	.15
Total variable expenses	4.42	4.65	4.87
Fixed:			
General farm overhead	.50	.46	.46
Taxes and insurance	.17	.15	.14
Interest (real estate)	.44	.30	.57
Interest (nonreal estate)	.75	.59	.66
Total fixed expenses	1.85	1.50	1.83
Total cash expenses	6.27	6.15	6.70
Receipts less cash expenses	1.78	1.90	1.35
Capital replacement	.70	.77	.71
Total expenses and replacement costs			
excl. real estate interest	6.54	6.62	6.85
Total expenses and replacement costs	6.97	6.92	7.41
Receipts less cash expenses and capital replacement costs	1.08	1.13	.63
Economic (full ownership) costs:			
Variable expenses	4.42	4.65	4.87
General farm overhead	.50	.46	.46
Taxes and insurance	.17	.15	.14
Capital replacement	.70	.77	.71
Allocated returns to owned inputs:			
Return to operating capital	.14	.15	.16
Return to other nonland capital	.28	.25	.11
Net land rent	1.84	1.95	1.74
Unpaid labor	1.32	1.26	1.01
Total economic costs	9.36	9.65	9.20
Residual returns to management and risk	-1.31	-1.60	-1.15
Harvest-period price (dollars/cwt)	8.05	8.05	8.05
Yield (cwt/planted acre)	51.94	48.62	51.73

1/ Numbers may not add due to rounding.

Table 3--Mississippi River Delta: Average rice production costs per planted acre by farm size class, 1984

	Farm size class		
	1-1000	1001-2000	2001+
Dollars			
Cash receipts (excl. Gov't payments):			
Primary crop	345.34	343.54	373.03
Total	345.34	343.54	373.03
Cash expenses:			
Variable:			
Seed	30.93	25.86	29.64
Fertilizer	37.87	62.58	29.32
Chemicals	8.57	18.13	11.05
Custom operations	48.97	42.17	37.21
Fuel and lube	12.60	6.08	7.90
Repairs	12.65	6.74	11.86
Drying	27.45	32.12	35.33
Technical services	4.04	3.58	3.43
Irrigation	20.32	32.18	21.22
Hired labor	14.28	23.30	19.82
Purchased water	0.26	0.19	-
Total variable expenses	217.94	252.93	206.78
Fixed:			
General farm overhead	27.16	23.31	18.23
Taxes and insurance	7.91	4.55	6.21
Interest (real estate)	18.06	11.70	21.53
Interest (nonreal estate)	45.84	30.52	25.40
Total fixed expenses	98.97	70.08	71.37
Total cash expenses	316.91	323.01	278.15
Receipts less cash expenses	28.43	20.53	94.88
Capital replacement	31.49	34.46	35.38
Total expenses and replacement costs			
excl. real estate interest	330.34	345.77	292.00
Total expenses and replacement costs	348.40	357.47	313.53
Receipts less cash expenses and capital replacement costs	-3.06	-13.93	59.50
Economic (full ownership) costs:			
Variable expenses	217.94	252.93	206.78
General farm overhead	27.16	23.31	18.23
Taxes and insurance	7.91	4.55	6.21
Capital replacement	31.49	34.46	35.38
Allocated returns to owned inputs:			
Return to operating capital	7.12	8.27	6.76
Return to other nonland capital	16.71	14.73	6.53
Net land rent	82.32	64.88	77.18
Unpaid labor	54.09	28.34	38.94
Total economic costs	444.74	431.47	396.01
Residual returns to management and risk	-99.40	-87.93	-22.98
Harvest-period price (dollars/cwt)	8.03	8.03	8.03
Yield (cwt/planted acre)	43.01	42.78	46.45

Table 4--Mississippi River Delta: Average rice production costs per hundredweight by farm size class, 1984 1/

	Farm size class		
	1-1000	1001-2000	2001+
Dollars			
Cash receipts (excl. Gov't payments):			
Primary crop	8.03	8.03	8.03
Total	8.03	8.03	8.03
Cash expenses:			
Variable:			
Seed	.72	.60	.64
Fertilizer	.88	1.46	.63
Chemicals	.20	.42	.24
Custom operations	1.14	.99	.80
Fuel and lube	.29	.14	.17
Repairs	.29	.16	.25
Drying	.64	.75	.76
Technical services	.09	.08	.07
Irrigation	.47	.75	.46
Hired labor	.33	.54	.43
Purchased water	.01	.00	-
Total variable expenses	5.07	5.91	4.45
Fixed:			
General farm overhead	.63	.54	.39
Taxes and insurance	.18	.11	.13
Interest (real estate)	.42	.27	.46
Interest (nonreal estate)	1.07	.71	.55
Total fixed expenses	2.30	1.64	1.54
Total cash expenses	7.37	7.55	5.99
Receipts less cash expenses	.66	.48	2.04
Capital replacement	.73	.81	.76
Total expenses and replacement costs			
excl. real estate interest	7.68	8.08	6.29
Total expenses and replacement costs	8.10	8.36	6.75
Receipts less cash expenses and capital replacement costs	-.07	-.33	1.28
Economic (full ownership) costs:			
Variable expenses	5.07	5.91	4.45
General farm overhead	.63	.54	.39
Taxes and insurance	.18	.11	.13
Capital replacement	.73	.81	.76
Allocated returns to owned inputs:			
Return to operating capital	.17	.19	.15
Return to other nonland capital	.39	.34	.14
Net land rent	1.91	1.52	1.66
Unpaid labor	1.26	.66	.84
Total economic costs	10.34	10.09	8.53
Residual returns to management and risk	-2.31	-2.06	-.50
Harvest-period price (dollars/cwt)	8.03	8.03	8.03
Yield (cwt/planted acre)	43.01	42.78	46.45

1/ Numbers may not add due to rounding.

Table 5--Arkansas (non-Delta): Average rice production costs
per planted acre by farm size class, 1984

	Farm size class		
	1-1000	1001-2000	2001+
Dollars			
Cash receipts (excl. Gov't payments):			
Primary crop	412.96	392.11	409.32
Total	412.96	392.11	409.32
Cash expenses:			
Variable:			
Seed	24.81	25.47	24.58
Fertilizer	29.26	26.81	36.19
Chemicals	0.46	1.36	1.28
Custom operations	40.50	34.03	51.02
Fuel and lube	11.91	10.65	11.24
Repairs	9.82	9.71	12.50
Drying	23.70	21.09	32.23
Technical services	4.55	3.39	3.62
Irrigation	40.19	31.58	35.02
Hired labor	16.24	11.48	30.67
Purchased water	-	-	3.33
Total variable expenses	201.44	175.57	241.68
Fixed:			
General farm overhead	23.37	19.01	17.77
Taxes and insurance	8.03	7.16	8.49
Interest (real estate)	31.01	12.58	23.71
Interest (nonreal estate)	43.07	23.51	22.58
Total fixed expenses	105.48	62.26	72.55
Total cash expenses	306.92	237.83	314.23
Receipts less cash expenses	106.04	154.28	95.09
Capital replacement	37.55	35.37	44.12
Total expenses and replacement costs	313.46	260.62	334.64
excl. real estate interest	344.47	273.20	358.35
Receipts less cash expenses and capital replacement costs	68.49	118.91	50.97
Economic (full ownership) costs:			
Variable expenses	201.44	175.57	241.68
General farm overhead	23.37	19.01	17.77
Taxes and insurance	8.03	7.16	8.49
Capital replacement	37.55	35.37	44.12
Allocated returns to owned inputs:			
Return to operating capital	6.58	5.74	7.90
Return to other nonland capital	14.71	12.68	6.92
Net land rent	83.65	104.29	103.28
Unpaid labor	65.08	58.53	54.04
Total economic costs	440.41	418.35	484.20
Residual returns to management and risk	-27.45	-26.24	-74.88
Harvest-period price (dollars/cwt)	8.19	8.19	8.19
Yield (cwt/planted acre)	50.42	47.88	49.98

Table 6--Arkansas (non-Delta): Average rice production costs
per hundredweight by farm size class, 1984 1/

	Farm size class		
	1-1000	1001-2000	2001+
Dollars			
Cash receipts (excl. Gov't payments):			
Primary crop	8.19	8.19	8.19
Total	8.19	8.19	8.19
Cash expenses:			
Variable:			
Seed	.49	.53	.49
Fertilizer	.58	.56	.72
Chemicals	.01	.03	.03
Custom operations	.80	.71	1.02
Fuel and lube	.24	.22	.22
Repairs	.19	.20	.25
Drying	.47	.44	.64
Technical services	.09	.07	.07
Irrigation	.80	.66	.70
Hired labor	.32	.24	.61
Purchased water	-	-	.07
Total variable expenses	4.00	3.67	4.84
Fixed:			
General farm overhead	.46	.40	.36
Taxes and insurance	.16	.15	.17
Interest (real estate)	.62	.26	.47
Interest (nonreal estate)	.85	.49	.45
Total fixed expenses	2.09	1.30	1.45
Total cash expenses	6.09	4.97	6.29
Receipts less cash expenses	2.10	3.22	1.90
Capital replacement	.74	.74	.88
Total expenses and replacement costs	6.22	5.44	6.69
excl. real estate interest	6.83	5.71	7.17
Receipts less cash expenses and capital replacement costs	1.36	2.48	1.02
Economic (full ownership) costs:			
Variable expenses	4.00	3.67	4.84
General farm overhead	.46	.40	.36
Taxes and insurance	.16	.15	.17
Capital replacement	.74	.74	.88
Allocated returns to owned inputs:			
Return to operating capital	.13	.12	.16
Return to other nonland capital	.29	.26	.14
Net land rent	1.66	2.18	2.07
Unpaid labor	1.29	1.22	1.08
Total economic costs	8.73	8.74	9.69
Residual returns to management and risk	-.54	-.55	-1.50
Harvest-period price (dollars/cwt)	8.19	8.19	8.19
Yield (cwt/planted acre)	50.42	47.88	49.98

1/ Numbers may not add due to rounding.

Table 7--Gulf Coast: Average rice production costs
per planted acre by farm size class, 1984

	Farm size class		
	1-1000 Dollars	1001-2000 Dollars	2001+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	382.40	382.46	422.53
Total	382.40	382.46	422.53
Cash expenses:			
Variable:			
Seed	27.11	27.29	39.33
Fertilizer	39.14	55.84	41.08
Chemicals	1.12	1.54	9.73
Custom operations	49.97	58.16	51.06
Fuel and lube	13.29	16.47	14.07
Repairs	11.07	13.33	12.12
Drying	36.94	39.08	41.37
Technical services	0.61	2.48	4.68
Irrigation	32.76	33.50	32.69
Hired labor	17.70	14.36	24.60
Purchased water	20.46	9.40	18.33
Total variable expenses	250.17	271.45	289.06
Fixed:			
General farm overhead	21.10	22.75	32.44
Taxes and insurance	10.50	9.75	8.71
Interest (real estate)	6.22	12.68	32.49
Interest (nonreal estate)	28.19	37.38	34.86
Total fixed expenses	66.01	82.56	108.50
Total cash expenses	316.18	354.01	397.56
Receipts less cash expenses	66.22	28.45	24.97
Capital replacement	38.95	43.19	36.42
Total expenses and replacement costs			
excl. real estate interest	348.91	384.52	401.49
Total expenses and replacement costs	355.13	397.20	433.98
Receipts less cash expenses and capital replacement costs	27.27	-14.74	-11.45
Economic (full ownership) costs:			
Variable expenses	250.17	271.45	289.06
General farm overhead	21.10	22.75	32.44
Taxes and insurance	10.50	9.75	8.71
Capital replacement	38.95	43.19	36.42
Allocated returns to owned inputs:			
Return to operating capital	8.18	8.87	9.57
Return to other nonland capital	11.15	8.47	4.04
Net land rent	91.24	76.03	77.35
Unpaid labor	80.56	92.62	73.00
Total economic costs	511.85	533.13	530.59
Residual returns to management and risk	-129.45	-150.67	-108.06
Harvest-period price (dollars/cwt)	8.23	8.23	8.23
Yield (cwt/planted acre)	46.46	46.47	51.34

Table 8--Gulf Coast: Average rice production costs
per hundredweight by farm size class, 1984 1/

	Farm size class		
	1-1000 Dollars	1001-2000 Dollars	2001+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	8.23	8.23	8.23
Total	8.23	8.23	8.23
Cash expenses:			
Variable:			
Seed	.58	.59	.77
Fertilizer	.84	1.20	.80
Chemicals	.02	.03	.19
Custom operations	1.08	1.25	.99
Fuel and lube	.29	.35	.27
Repairs	.24	.24	.24
Drying	.79	.84	.81
Technical services	.01	.05	.09
Irrigation	.70	.72	.64
Hired labor	.38	.31	.48
Purchased water	.44	.20	.36
Total variable expenses	5.38	5.84	5.63
Fixed:			
General farm overhead	.45	.49	.63
Taxes and insurance	.23	.21	.17
Interest (real estate)	.13	.27	.63
Interest (nonreal estate)	.61	.80	.68
Total fixed expenses	1.42	1.78	2.11
Total cash expenses	6.81	7.62	7.74
Receipts less cash expenses	1.43	.61	.49
Capital replacement	.84	.93	.71
Total expenses and replacement costs			
excl. real estate interest	7.51	8.27	7.82
Total expenses and replacement costs	7.64	8.55	8.45
Receipts less cash expenses and capital replacement costs	.59	-.32	-.22
Economic (full ownership) costs:			
Variable expenses	5.38	5.84	5.63
General farm overhead	.45	.49	.63
Taxes and insurance	.23	.21	.17
Capital replacement	.84	.93	.71
Allocated returns to owned inputs:			
Return to operating capital	.18	.19	.19
Return to other nonland capital	.24	.18	.08
Net land rent	1.96	1.64	1.51
Unpaid labor	1.73	1.99	1.42
Total economic costs	11.02	11.47	10.33
Residual returns to management and risk	-2.79	-3.24	-2.10
Harvest-period price (dollars/cwt)	8.23	8.23	8.23
Yield (cwt/planted acre)	46.46	46.47	51.34

1/ Numbers may not add due to rounding.

Table 9--California: Average rice production costs
per planted acre by farm size class, 1984

	Farm size class		
	1-1000 Dollars	1001-2000 Dollars	2001+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	548.49	534.03	522.96
Total	548.49	534.03	522.96
Cash expenses:			
Variable:			
Seed	30.14	32.02	31.96
Fertilizer	54.51	35.20	36.84
Chemicals	2.40	3.22	11.54
Custom operations	72.29	97.87	66.75
Fuel and lube	8.76	13.25	9.09
Repairs	11.64	16.93	12.85
Drying	43.67	48.33	45.66
Technical services	1.62	0.61	0.37
Irrigation	8.81	9.93	9.01
Hired labor	39.08	50.99	78.08
Purchased water	12.88	8.30	13.37
Total variable expenses	285.80	316.65	315.52
Fixed:			
General farm overhead	42.27	35.90	31.19
Taxes and insurance	7.47	7.05	5.41
Interest (real estate)	29.50	36.19	51.23
Interest (nonreal estate)	40.46	27.55	71.07
Total fixed expenses	119.70	106.69	158.90
Total cash expenses	405.50	423.34	474.42
Receipts less cash expenses	142.99	110.69	48.54
Capital replacement	31.70	41.28	32.95
Total expenses and replacement costs	407.70	428.43	456.14
excl. real estate interest	437.20	464.62	507.37
Total expenses and replacement costs	407.70	428.43	456.14
Receipts less cash expenses and capital replacement costs	111.29	69.41	15.59
Economic (full ownership) costs:			
Variable expenses	285.80	316.65	315.52
General farm overhead	42.27	35.90	31.19
Taxes and insurance	7.47	7.05	5.41
Capital replacement	31.70	41.28	32.95
Allocated returns to owned inputs:			
Return to operating capital	9.39	10.35	10.31
Return to other nonland capital	17.87	11.75	5.80
Net land rent	147.31	156.46	130.15
Unpaid labor	66.15	63.20	45.61
Total economic costs	607.96	642.64	576.94
Residual returns to management and risk	-59.47	-108.61	-53.98
Harvest-period price (dollars/cwt.)	7.63	7.63	7.63
Yield (cwt/planted acre)	71.89	69.99	68.54

Table 10--California: Average rice production costs
per hundredweight by farm size class, 1984 1/

	Farm size class		
	1-1000 Dollars	1001-2000 Dollars	2001+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	7.63	7.63	7.63
Total	7.63	7.63	7.63
Cash expenses:			
Variable:			
Seed	.42	.46	.47
Fertilizer	.76	.50	.54
Chemicals	.03	.05	.17
Custom operations	1.01	1.40	.97
Fuel and lube	.12	.19	.13
Repairs	.16	.24	.19
Drying	.61	.69	.67
Technical services	.02	.01	.01
Irrigation	.12	.14	.13
Hired labor	.54	.73	1.14
Purchased water	.18	.12	.20
Total variable expenses	3.98	4.52	4.60
Fixed:			
General farm overhead	.59	.51	.46
Taxes and insurance	.10	.10	.08
Interest (real estate)	.41	.52	.75
Interest (nonreal estate)	.56	.39	1.04
Total fixed expenses	1.66	1.52	2.32
Total cash expenses	5.64	6.05	6.92
Receipts less cash expenses	1.99	1.58	.71
Capital replacement	.44	.59	.48
Total expenses and replacement costs	5.67	6.12	6.66
excl. real estate interest	6.08	6.64	7.40
Total expenses and replacement costs	5.67	6.12	6.66
Receipts less cash expenses and capital replacement costs	1.55	.99	.23
Economic (full ownership) costs:			
Variable expenses	3.98	4.52	4.60
General farm overhead	.59	.51	.46
Taxes and insurance	.10	.10	.08
Capital replacement	.44	.59	.48
Allocated returns to owned inputs:			
Return to operating capital	.13	.15	.15
Return to other nonland capital	.25	.17	.08
Net land rent	2.05	2.24	1.90
Unpaid labor	.92	.90	.67
Total economic costs	8.46	9.18	8.42
Residual returns to management and risk	-.83	-1.55	-.79
Harvest-period price (dollars/cwt)	7.63	7.63	7.63
Yield (cwt/planted acre)	71.89	69.99	68.54

1/ Numbers may not add due to rounding.

Table 11--United States: Average land use and tenure on rice farms
by farm size class, 1984 ^{1/}

Land	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Acres</u>		
Owned	153	239	1,971
Rented:			
Cash	91	265	913
Share	266	876	1,597
Free	82	16	2
Rented out	6	41	255
Total operated	585	1,355	4,228
Planted acreage:			
Rice	181	260	835
Barley	^{2/}	2	2
Corn	³	6	30
Cotton	9	42	180
Oats	0	1	8
Peanuts	0	0	3
Sorghum	23	72	103
Soybeans	219	715	1,900
Sugarbeets	0	2	8
Sunflowers	0	0	5
Vegetables	2	1	18
Wheat	56	182	683
Pasture	17	41	420

^{1/} Numbers may not add due to rounding.

^{2/} Average is less than 1.0.

Source: 1984 Farm Costs and Returns Survey.

Table 12--Mississippi River Delta: Average land use and tenure on rice farms
by farm size class, 1984 1/

Land	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
		<u>Acres</u>	
Owned	172	155	2,307
Rented:			
Cash	229	672	935
Share	305	588	1,671
Free	0	0	<u>2/</u>
Rented out	7	35	<u>97</u>
Total operated	699	1,380	4,546
Planted acreage:			
Rice	160	193	697
Corn	0	<u>2/</u>	<u>2/</u>
Cotton	49	<u>147</u>	<u>340</u>
Oats	0	0	1
Sorghum	48	96	120
Soybeans	330	698	2,905
Sunflowers	0	0	<u>2/</u>
Wheat	<u>44</u>	98	<u>1,071</u>
Pasture	<u>2/</u>	6	19

1/ Numbers may not add due to rounding.

2/ Average is less than 1.0.

Source: 1984 Farm Costs and Returns Survey.

Table 13--Arkansas (non-Delta): Average land use and tenure on rice farms
by farm size class, 1984 1/

Land	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Acres</u>		
Owned	164	220	1,416
Rented:			
Cash	69	72	191
Share	242	1,003	1,402
Free	153	24	0
Rented out	2	10	12
Total operated	627	1,308	2,997
Planted acreage:			
Rice	165	222	746
Corn	<u>2/</u>	0	28
Cotton	165	222	746
Oats	0	2	0
Sorghum	23	63	116
Soybeans	256	854	1,592
Wheat	93	267	537
Pasture	16	5	0

1/ Numbers may not add due to rounding.

2/ Average is less than 1.0.

Source: 1984 Farm Costs and Returns Survey.

Table 14--Gulf Coast: Average land use and tenure on rice farms
by farm size class, 1984 1/

Land	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Acres</u>		
Owned	94	183	1,381
Rented:			
Cash	89	377	1,583
Share	337	891	2,102
Free	7	19	8
Rented out	5	9	439
Total operated	522	1,462	4,635
Planted acreage:			
Rice	196	443	1,086
Corn	4	21	51
Cotton	0	0	73
Oats	0	0	18
Peanuts	0	0	13
Sorghum	18	89	88
Soybeans	192	416	968
Wheat	6	3	156
Pasture	32	259	1,004

1/ Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 15--California: Average land use and tenure on rice farms
by farm size class, 1984 1/

Land	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Acres</u>		
Owned	212	1,151	3,842
Rented:			
Cash	54	17	916
Share	177	873	699
Free	1	0	0
Rented out	20	570	1,031
Total operated	425	1,472	4,426
Planted acreage:			
Rice	243	545	1,114
Barley	1	39	14
Corn	13	65	118
Cotton	0	108	0
Oats	0	0	30
Sorghum	7	8	32
Sugarbeets	0	52	70
Sunflowers	0	0	41
Vegetables	16	28	161
Wheat	10	190	315
Pasture	4	20	1,795

1/ Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 16--United States: Average rice yields and degree of specialization on rice farms by farm size class, 1984

Item	Unit	Farm size class		
		1,000 acres or less	1,001-2,000 acres	2,001 acres or more
Acreage:				
Rice	Acres	181	260	835
Total farm	Acres	585	1,355	4,228
Rice acreage as a share of farm acreage	Percent	30.9	19.2	19.7
Rice yield per planted acre	Cwt	51.94	48.62	51.73

Source: 1984 Farm Costs and Returns Survey.

Table 17--Mississippi River Delta: Average rice yields and degree of specialization on rice farms by farm size class, 1984

Item	Unit	Farm size class		
		1,000 acres or less	1,001-2,000 acres	2,001 acres or more
Acreage:				
Rice	Acres	160	193	697
Total farm	Acres	699	1,380	4,546
Rice acreage as a share of farm acreage	Percent	22.9	14.0	15.3
Rice yield per planted acre	Cwt	43.01	42.78	46.45

Source: 1984 Farm Costs and Returns Survey.

Table 18--Arkansas (non-Delta): Average rice yields and degree of specialization on rice farms by farm size class, 1984

Item	Unit	Farm size class		
		1,000 acres or less	1,001-2,000 acres	2,001 acres or more
Acreage:				
Rice	Acres	165	222	746
Total farm	Acres	627	1,308	2,997
Rice acreage as a share of farm acreage	Percent	26.3	17.0	24.9
Rice yield per planted acre	Cwt	50.42	47.88	49.98

Source: 1984 Farm Costs and Returns Survey.

Table 19--Gulf Coast: Average rice yields and degree of specialization on rice farms by farm size class, 1984

Item	Unit	Farm size class		
		1,000 acres or less	1,001-2,000 acres	2,001 acres or more
Acreage:				
Rice	Acres	196	443	1,086
Total farm	Acres	522	1,462	4,635
Rice acreage as a share of farm acreage	Percent	37.5	30.3	23.4
Rice yield per planted acre	Cwt	46.46	46.47	51.34

Source: 1984 Farm Costs and Returns Survey.

Table 20--California: Average rice yields and degree of specialization on rice farms by farm size class, 1984

Item	Unit	Farm size class		
		1,000 acres or less	1,001-2,000 acres	2,001 acres or more
Acreage:				
Rice	Acres	243	545	1,114
Total farm	Acres	425	1,472	4,426
Rice acreage as a share of farm acreage	Percent	57.3	37.0	25.2
Rice yield per planted acre	Cwt	71.89	69.99	68.54

Source: 1984 Farm Costs and Returns Survey.

Table 21--Average rice seeding rates on farms by farm size class and region, 1984

Region	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Pounds per acre</u>		
Mississippi River Delta	163	136	156
Arkansas (non-Delta)	131	134	129
Gulf Coast	143	144	207
California	159	169	168
United States	142	140	167

Source: 1984 Farm Costs and Returns Survey.

Table 22--Average rice fertilization rates on farms by farm size class
and region, 1984

Region and fertilizer	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Pounds per acre</u>		
Mississippi River Delta:			
Nitrogen	150	D	122
Phosphate	4	3	0
Potash	7	3	2
Arkansas (non-Delta):			
Nitrogen	115	85	144
Phosphate	5	6	4
Potash	7	20	9
Gulf Coast:			
Nitrogen	105	110	119
Phosphate	49	46	44
Potash	32	36	33
California:			
Nitrogen	101	72	89
Phosphate	55	30	33
Potash	3	1	1
United States:			
Nitrogen	114	122	120
Phosphate	25	17	18
Potash	13	19	12

D = Insufficient data for disclosure.

Source: 1984 Farm Costs and Returns Survey.

Table 23--United States: Average value of farm assets, debt, and net worth on rice farms by farm size class, January 1, 1985 ^{1/}

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	188,011	342,886	2,144,650
Trucks and automobiles	16,667	20,569	48,957
Tractors	35,405	57,679	171,358
Other equipment	55,507	68,782	206,403
Livestock and poultry	3,833	3,867	11,291
Purchased inputs on hand	3,784	1,013	3,622
Crops stored on/off farm	34,044	75,327	207,987
Total	337,260	570,124	2,794,268
Total farm debt	102,449	205,883	779,503
Total net worth	234,811	364,242	2,014,765
Debt/asset ratio	.30	.36	.28
	<u>Dollars per acre</u>		
Machinery investment	184	109	101
Assets	577	421	661
Debt	175	152	184
Net worth	401	269	477

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 24--Mississippi River Delta: Average value of farm assets, debt, and net worth on rice farms by farm size class, January 1, 1985 ^{1/}

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	181,159	223,976	1,511,916
Trucks and automobiles	14,026	35,647	56,949
Tractors	37,773	86,804	135,218
Other equipment	54,731	106,908	203,534
Livestock and poultry	3,932	2,477	6,894
Purchased inputs on hand	38	1,606	859
Crops stored on/off farm	54,024	55,764	171,008
Total	345,682	513,181	2,086,377
Total farm debt	171,570	318,513	512,801
Total net worth	174,112	194,669	1,573,576
Debt/asset ratio	.50	.62	.25
	<u>Dollars per acre</u>		
Machinery investment	152	166	87
Assets	495	372	459
Debt	245	231	113
Net worth	249	141	346

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 25--Arkansas (non-Delta): Average value of farm assets, debt, and net worth on rice farms by farm size class, January 1, 1985 ^{1/}

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	149,362	283,764	2,584,490
Trucks and automobiles	18,166	12,840	31,312
Tractors	30,448	35,864	220,476
Other equipment	55,752	37,324	189,470
Livestock and poultry	4,554	620	0
Purchased inputs on hand	5,968	1,000	275
Crops stored on/off farm	34,064	95,753	201,824
Total	298,314	467,165	3,227,847
Total farm debt	90,869	138,274	610,766
Total net worth	207,446	328,891	2,617,082
Debt/asset ratio	.30	.30	.19
	<u>Dollars per acre</u>		
Machinery investment	166	66	147
Assets	476	357	1,077
Debt	145	106	204
Net worth	331	251	873

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 26--Gulf Coast: Average value of farm assets, debt, and net worth on rice farms by farm size class, January 1, 1985 1/

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	138,991	277,712	1,835,304
Trucks and automobiles	14,822	21,458	44,274
Tractors	36,182	74,721	179,959
Other equipment	38,147	96,222	183,640
Livestock and poultry	2,521	17,193	27,776
Purchased inputs on hand	137	310	6,214
Crops stored on/off farm	30,612	51,279	244,822
Total	261,411	538,894	2,521,989
Total farm debt	69,091	194,934	971,560
Total net worth	192,320	343,960	1,550,429
Debt/asset ratio	.26	.36	.39
	<u>Dollars per acre</u>		
Machinery investment	171	132	88
Assets	501	369	544
Debt	132	133	210
Net worth	368	235	335

1/ Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 27--California: Average value of farm assets, debt, and net worth on rice farms by farm size class, January 1, 1985 ^{1/}

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	474,507	1,996,752	4,569,008
Trucks and automobiles	16,618	29,102	57,189
Tractors	53,665	113,139	215,342
Other equipment	92,726	162,040	293,131
Livestock and poultry	3,332	10,795	19,925
Purchased inputs on hand	5,556	0	16,654
Crops stored on/off farm	21,639	4,603	305,948
Total	668,044	2,316,431	5,447,197
Total farm debt	158,363	452,034	1,857,742
Total net worth	509,681	1,864,397	3,619,455
Debt/asset ratio	.24	.20	.34
	<u>Dollars per acre</u>		
Machinery investment	384	207	128
Assets	1,572	1,574	1,238
Debt	373	307	420
Net worth	1,199	1,267	818

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 28--United States: Average farm income and expenses
on rice farms by farm size class, 1984 1/

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	106,825	234,168	734,963
Government payments	15,480	21,092	41,704
Other	4,470	5,158	41,401
Total	126,775	260,418	818,068
Operating expenses:			
Fertilizer and lime	16,035	27,355	84,171
Chemicals	10,098	20,995	64,152
Paid labor	8,471	15,276	85,097
Custom work	1,872	3,531	17,118
Interest on--			
Real estate debt	5,889	7,790	55,978
Nonreal estate debt	10,243	14,327	59,435
Other	57,631	100,028	317,258
Total	110,239	189,302	683,209
Net cash farm income	16,536	71,116	134,859
Off-farm income	5,419	5,348	4,788
Total family income	21,955	76,464	139,647
	<u>Dollars per acre</u>		
Gross farm income	217	192	193
Operating expenses <u>3/</u>	161	123	134
Interest	28	16	27
Net cash farm income	28	52	32

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 29--Mississippi River Delta: Average farm income and expenses
on rice farms by farm size class, 1984 1/

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	123,867	230,349	626,870
Government payments	7,082	25,919	31,238
Other	2,471	5,416	13,766
Total	133,420	261,684	671,874
Operating expenses:			
Fertilizer and lime	15,504	30,475	71,100
Chemicals	14,968	30,207	59,471
Paid labor	8,574	21,282	74,952
Custom work	2,128	4,897	12,208
Interest on--			
Real estate debt	4,472	11,164	50,490
Nonreal estate debt	16,295	19,806	52,906
Other	64,291	138,503	255,686
Total	126,232	256,334	576,813
Net cash farm income	7,188	5,350	95,061
Off-farm income	6,647	3,451	745
Total family income	13,835	8,801	95,806
	<u>Dollars per acre</u>		
Gross farm income	191	189	148
Operating expenses <u>3/</u>	151	163	104
Interest	30	22	23
Net cash farm income	10	4	21

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 30--Arkansas (non-Delta): Average farm income and expenses
on rice farms by farm size class, 1984 1/

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	101,055	219,579	609,421
Government payments	17,467	14,872	38,708
Other	3,559	1,249	8,299
Total	122,081	235,700	656,428
Operating expenses:			
Fertilizer and lime	15,586	22,121	74,864
Chemicals	8,936	12,969	53,864
Paid labor	8,188	8,268	69,581
Custom work	693	758	10,396
Interest on--			
Real estate debt	7,139	3,988	39,933
Nonreal estate debt	9,812	9,287	34,577
Other	52,982	65,174	229,911
Total	103,336	122,565	513,126
Net cash farm income	18,745	113,135	143,302
Off-farm income	4,285	3,310	11,998
Total family income	23,030	116,445	155,300
	<u>Dollars per acre</u>		
Gross farm income	195	180	219
Operating expenses <u>3/</u>	138	84	146
Interest	27	10	25
Net cash farm income	30	86	48

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 31--Gulf Coast: Average farm income and expenses
on rice farms by farm size class, 1984 1/

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	87,873	212,487	586,109
Government payments	11,272	27,137	54,835
Other	2,229	5,360	120,123
Total	101,374	244,984	761,067
Operating expenses:			
Fertilizer and lime	15,497	35,209	99,795
Chemicals	9,696	30,389	71,272
Paid labor	6,431	17,665	79,709
Custom work	1,655	3,791	16,259
Interest on--			
Real estate debt	2,361	7,279	43,979
Nonreal estate debt	6,913	23,733	53,052
Other	52,966	122,608	210,061
Total	95,519	240,674	754,127
Net cash farm income	5,855	4,310	6,940
Off-farm income	4,174	16,936	3,903
Total family income	10,029	21,246	10,843
	<u>Dollars per acre</u>		
Gross farm income	194	167	164
Operating expenses <u>3/</u>	165	143	142
Interest	18	21	21
Net cash farm income	11	3	1

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 32--California: Average farm income and expenses
on rice farms by farm size class, 1984 1/

Item	Farm size class		
	1,000 acres or less	1,001-2,000 acres	2,001 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	156,917	512,173	1,706,294
Government payments	23,948	53,272	66,680
Other	15,384	52,987	71,569
Total	196,249	618,432	1,844,543
Operating expenses:			
Fertilizer and lime	19,745	51,040	127,255
Chemicals	11,380	40,108	89,752
Paid labor	14,053	62,379	167,088
Custom work	7,392	30,214	52,029
Interest on--			
Real estate debt	9,306	38,468	131,792
Nonreal estate debt	13,406	16,897	145,577
Other	82,022	250,235	602,385
Total	157,304	489,341	1,315,878
Net cash farm income	38,945	129,091	528,665
Off-farm income	11,989	5,324	9,975
Total family income	50,934	134,415	538,640
	<u>Dollars per acre</u>		
Gross farm income	462	420	417
Operating expenses <u>3/</u>	317	295	235
Interest	53	38	63
Net cash farm income	92	88	119

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 33--Tractors: Average number and horsepower on rice farms
by farm size class and region, 1984

Item	Farm size class					
	1,000 acres or less		1,001-2,000 acres		2,001 acres or more	
	Number	Horse- power 1/	Number	Horse- power 1/	Number	Horse- power 1/
Mississippi River Delta:						
Two-wheel drive	2.0	120	3.7	144	3.2	139
Four-wheel drive	1.1	146	.2	176	1.5	217
Crawler	--	--	<u>2/</u>	36	<u>2/</u>	260
Four-wheel assist	.3	218	.1	169	<u>2/</u>	155
Arkansas (non-Delta):						
Two-wheel drive	2.8	121	3.7	136	4.4	145
Four-wheel drive	.3	210	.5	180	2.1	220
Crawler	--	--	<u>2/</u>	145	.1	37
Four-wheel assist	<u>2/</u>	185	<u>2/</u>	282	.1	61
Gulf Coast:						
Two-wheel drive	2.8	114	3.3	115	3.4	125
Four-wheel drive	.5	132	1.4	184	3.0	192
Crawler	--	--	.1	53	.1	103
Four-wheel assist	<u>2/</u>	222	.2	97	.1	315
California:						
Two-wheel drive	.8	95	.7	105	.7	103
Four-wheel drive	.7	185	1.0	194	.8	186
Crawler	1.6	150	3.5	209	2.0	162
Four-wheel assist	.1	124	--	--	--	--
United States:						
Two-wheel drive	2.5	118	3.5	134	3.2	136
Four-wheel drive	.5	178	.6	182	1.9	208
Crawler	.2	150	.2	195	.3	151
Four-wheel assist	.1	172	.1	164	.1	183

-- = Not applicable.

1/ Power take-off horsepower.

2/ Average is less than 0.1.

Source: 1984 Farm Costs and Returns Survey.

Table 34--Mississippi River Delta: Average size, horsepower, and times-over of implements used in rice production by farm size class, 1984

Farm size class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
1,000 acres or less:			
Tandem disk, regular	20.0	149	1.40
Land plane	14.2	179	.94
Field cultivator	25.9	164	.90
Offset, heavy duty disk	22.1	166	.52
Levee plow	7.0	121	.45
Drill, plain	19.3	131	.45
Field conditioner	21.1	152	.41
Roller packer	19.4	162	.37
Broadcast seeder	17.4	119	.34
Combine, four-wheel drive	19.8	<u>1</u> /	.34
1,001-2,000 acres:			
Tandem disk, regular	21.4	161	1.47
Drill, plain	19.7	158	.72
Land plane	17.6	161	.59
Combine, two-wheel drive	20.1	<u>1</u> /	.58
Field cultivator	28.2	<u>1</u> 69	.35
Levee plow	5.3	145	.19
Combine, four-wheel drive	19.3	<u>1</u> /	.18
Spiketooth harrow	24.8	<u>1</u> 34	.12
Finishing harrow	19.9	157	.12
Springtooth harrow	25.2	197	.11
2,001 acres or more:			
Land plane	19.9	199	.74
Tandem disk, regular	25.0	208	.74
Drill, plain	21.2	154	.73
Combine, two-wheel drive	20.1	<u>1</u> /	.58
Field cultivator	28.2	<u>1</u> 79	.57
Drill, no-till	20.7	143	.43
Combine, four-wheel drive	19.8	<u>1</u> /	.41
Roller packer	17.2	<u>1</u> 71	.32
Levee plow	6.8	152	.23
Tandem disk plowing	24.6	144	.14

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

Table 35--Arkansas (non-Delta): Average size, horsepower, and times-over of implements used in rice production by farm size class, 1984

Farm size class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>		<u>Number</u>
1,000 acres or less:			
Tandem disk, regular	21.1	159	2.92
Field cultivator	26.3	169	1.18
Land plane	14.9	148	.81
Cultipacker	12.5	204	.76
Broadcast seeder	28.0	122	.59
Levee plow	10.0	180	.50
Roller packer	19.8	180	.49
Combine two-wheel drive	17.1	1/	.39
Drill, plain	14.9	112	.35
Combine, combination	20.0	1/	.35
1,001-2,000 acres:			
Tandem disk, regular	20.8	168	1.92
Levee plow	7.6	162	.87
Float	14.5	157	.68
Combine, two-wheel drive	18.1	1/	.66
Drill, plain	18.8	117	.64
Field cultivator	24.2	170	.50
Broadcast seeder	13.1	108	.47
Landall	18.6	144	.42
Finishing harrow	18.8	152	.24
Roller packer	19.6	149	.19
2,001 acres or more:			
Land plane	44.6	197	1.15
Levee plow	9.3	176	1.13
Tandem disk, regular	31.0	227	1.13
Field cultivator	30.5	218	1.12
Drill, plain	24.0	176	.91
Combine, two-wheel drive	19.4	1/	.87
Combine, four-wheel drive	17.5	1/	.47
Float	16.0	164	.29
Roller packer	33.1	157	.20
Ditch closer	5.5	159	.19

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

Table 36--Gulf Coast: Average size, horsepower, and times-over of implements used in rice production by farm size class, 1984

Farm size class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
1,000 acres or less:			
Combine, two-wheel drive	16.2	1/	.92
Tandem disk, regular	18.2	162	.82
Field cultivator	24.3	150	.57
Land plane	16.6	160	.49
Springtooth harrow	21.4	150	.34
Drill, plain	17.3	136	.33
Levee plow	8.7	140	.33
Offset, heavy duty disk	13.6	146	.31
Ditcher blade	3.0	89	.31
Disk plow	17.0	144	.27
1,001-2,000 acres:			
Tandem disk, regular	19.5	161	.96
Field cultivator	27.4	175	.91
Combine, two-wheel drive	16.4	1/	.84
Land plane	23.7	173	.65
Offset, heavy duty disk	16.5	166	.52
Combine, four-wheel drive	19.9	1/	.46
Tandem disk plow	17.7	180	.35
Ditcher blade	2.0	86	.34
Springtooth harrow	23.4	146	.31
Roller packer	29.6	130	.29
2,001 acres or more:			
Tandem disk, regular	21.8	196	.85
Field cultivator	25.8	204	.77
Land plane	18.9	205	.51
Combine, two-wheel drive	17.1	1/	.45
Combine, four-wheel drive	19.3	1/	.45
Offset, heavy duty disk	20.3	223	.43
Ditcher blade	1.7	128	.39
Drill, plain	23.4	129	.32
Springtooth harrow	23.0	138	.23
Spiketooth harrow	21.6	166	.22

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

Table 37--California: Average size, horsepower, and times-over of implements used in rice production by farm size class, 1984

Farm size class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
1,000 acres or less:			
Chisel plow	17.6	166	1.31
Land plane	17.4	158	1.11
Offset, heavy duty disk	18.5	177	.99
Combine, track	17.1	1/	.62
Tandem disk, regular	18.2	153	.46
Offset, light duty disk	17.6	154	.39
Combine, combination	17.0	1/	.27
Liquid fert. appl., trac. mtd.	20.0	152	.23
Spiketooth harrow	20.7	149	.19
Liquid fert. appl., trail. mtd.	19.1	121	.18
1,001-2,000 acres:			
Offset, heavy duty disk	21.3	199	1.00
Land plane	17.2	240	.91
Combine, track	16.6	1/	.77
Tandem disk, regular	20.4	228	.73
Chisel plow	17.0	200	.71
One-way disk	18.0	191	.64
Disk chisel	16.8	160	.35
Spiketooth harrow	27.2	215	.23
Field conditioner	19.8	112	.18
Fert. appl.	28.1	201	.17
2,001 acres or more:			
Land plane	18.4	191	1.00
Chisel plow	18.7	187	.62
Liquid fert. appl., trail. mtd.	21.1	144	.59
Offset, heavy duty disk	21.6	204	.51
Combine, track	16.0	1/	.50
Combine, combination	22.0	1/	.39
Tandem disk, regular	25.8	129	.32
Offset, light duty disk	20.5	202	.28
Single disk	18.0	200	.21
Liquid fert. appl., trac. mtd.	21.7	137	.19

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

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ECONOMICS OF SIZE FOR U.S. RICE FARMS
BY RICE ACREAGE, 1984

Dargan Glaze

A renewed interest in the effects of farm size on agriculture in the United States is taking place. Producers, researchers, and policymakers want more information concerning the effects that farm size has on the profitability, survivability, performance, and efficiency of farms. The Economic Research Service (ERS) developed a procedure that analyzes farm size groups using farm-level data from the Farm Cost and Returns Survey (FCRS). This procedure provides more detailed information on production practices, input use, and prices than previously published data.

This paper provides information about the results of a recent ERS study that analyzes rice farms by rice acreage sizes. This paper presents the results from the new estimation procedure and evaluates the results to determine size characteristics and the attributes associated with them. The next section explains the concept of economies of size.

Methodology

Average rice production costs and farm operating and financial characteristics were estimated for rice farms in three rice acreage classes. The same methodology and underlying economics-of-size foundation used in the previous paper, concerning production costs and farm characteristics by farm size class, is used here. Costs-of-production budgets were estimated for farms in each rice acreage class using a farm-level budget generator (FLBG). Cost estimates are presented for the United States, as well as for four rice-producing regions (Mississippi River Delta, Arkansas non-Delta, Gulf Coast, and California).

The 1984 FCRS data for rice are used to estimate enterprise budgets for rice acreage classes. Rice yields are based on producer survey responses and prices are averages of harvest-month prices for each region. Survey observations were divided into three groups, based on rice acreage, of 150 acres or less, 151-300 acres, and 301 acres or more. Although the size groupings may seem somewhat arbitrary, a frequency distribution was used to determine the number of farms within a specific rice acreage group. The groups were chosen so that there were enough sample observations in each group, while at the same time containing a proportionate number of farms.

Budgets For Rice-Acreage-Size Classes

The enterprise budgets provide information about cash expenses paid in the production of rice. Average rice production costs per acre for each rice-acreage-size group for the United States are shown in table 1. Table 2 shows rice production costs per hundredweight (cwt) for the United States. Both tables show that as rice acreage increases, costs

Glaze is an agricultural economist in the Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA.

increase as well. Total variable expenses increase from \$210.91 per acre (\$4.44 per cwt) for farms with 1-150 rice acres to \$250.86 per acre (4.82 per cwt) for farms with 301 acres or more. Total cash expenses also increase as rice acreage increases from \$285.08 per acre (\$6.00 per cwt) for the 1-150 acre size group to \$339.10 per acre (\$6.52 per cwt) for the 301 or more acre size group. Cash receipts increase as rice acreage increases as a result of higher yields per acre.

It is not readily apparent from the results in tables 1 and 2 that farms with more rice acreage benefit the most from size economies, regional enterprise budgets provide more insight into size differences. Average rice production costs per acre for each rice acreage class for the four costs-of-production (COP) regions are shown in tables 3, 5, 7, and 9. Average rice production costs per cwt for each region by rice acreage class are shown in tables 4, 6, 8, and 10.

Average total variable expenses for the Mississippi River Delta region decrease from \$259.73 per acre (\$5.89 per cwt) for farms with 1-150 rice acres to \$206.81 per acre (\$4.58 per cwt) for farms with 301 or more rice acres (tables 3-4). In addition, average total cash expenses decrease as rice acreage increases. Average receipts, less cash expenses, increase as rice acreage increases from \$10.49 per acre (\$0.24 per cwt) for the 1-150 acre size group to \$86.88 per acre (\$1.93 per cwt) for the 301 or more acre size group. There are minor differences in yields per acre among the size groups.

Average total variable expenses for farms in the Arkansas (non-Delta) region increase as rice acreage increased from \$177.78 (\$3.57 per cwt) per acre for farms with 1-150 acres of rice to \$206.98 (\$4.32 per cwt) per acre for farms with 301 or more rice acres (tables 5-6). Average total cash expenses also increased as rice acreage increases. Average receipts, less cash expenses, decrease from \$161.31 per acre (\$3.24 per cwt) for the 1-150 acre size group to less than \$115.00 per acre for the larger rice acreage groups. Rice yields per planted acre averaged approximately 50.0 cwt for the 1-150 and 151-300 acreage classes and about 47.9 cwt for the 301 and more acreage class.

Average total variable expenses increase as rice acreage increases in the Gulf Coast region from \$206.44 per acre (\$4.85 per cwt) for farms with 1 to 150 rice acres to \$286.84 per acre (\$5.74 per cwt) for farms with 301 or more rice acres (tables 7-8). Average total cash expenses also increase as rice acreage increases whereas average receipts, less cash expenses, decrease as rice acreage increases, despite the fact that farms with larger rice acreages reported slightly higher average rice yields. Farms with 1-150 and 151-300 rice acres reported an average yield per planted acre of 42.56 and 44.29 cwt, respectively. Farms with 301 or more acres of rice reported average yields per planted acre of 49.93 cwt.

California farms with 1-150 acres of rice had the highest estimated variable expenses, averaging \$349.82 per acre (\$5.88 per cwt). The lowest total variable rice production expenses were observed on farms with 151-300 acres rice at \$285.71 per acre (\$4.13 per cwt) (tables 9-10). Average total cash expenses also decrease as rice acreage increases. Average receipts, less cash expenses, increase almost fifteenfold from only \$7.53 per acre (\$0.13 per cwt) for the smallest size group to \$107.48 per acre (\$1.51 per cwt) for the largest size

group. There is a substantial difference in average yields among the size groups. The average yield per planted acre for farms with 1-150 acres of rice is 59.54 cwt, while farms with 151-300 and 301 or more acres of rice reported average yields per planted acre of 69.13 and 71.11 cwt, respectively.

Another area of interest is total economic (full ownership) costs. Economic costs are imputed charges for the farmer's own factors of production that can be used for comparisons without regard for producer equity levels or tenure.^{1/} Average total economic costs per planted acre of rice increase across size groups for the United States from \$455.27 for the 1-150 acre group to \$492.33 for the 301 or more acre size group (table 1). On a per cwt basis, estimated total economic production costs were lowest for the 151-300 acre size group, at \$9.16, and increased to \$9.46 in the largest acreage class and \$9.58 in the smallest acreage class (table 2).

Average total economic costs of production per planted acre of rice decreased as rice acreage increased in three of the four rice-producing regions. In the Gulf Coast region, economic costs were estimated to be \$446.70 per acre for farms with 1-150 acres of rice and \$480.47 and \$545.84 per acre, respectively, for farms in the two larger rice acreage classes (table 7). Significant decreases in economic costs per cwt as acreage of rice increased were observed in only two regions (Mississippi River Delta and California).

Farm Characteristics By Rice Acreage

U.S. rice costs-of-production estimates do not appear to exhibit economies of size from increasing rice acreage. Furthermore, the direction of change in production costs, as rice acreage increased, varied across regions. There are many factors that contribute to these differences among size groups within regions, as well as among regions.

Table 11 shows that not only do large U.S. rice farms have larger acreages of rice, but the farms are larger overall, in terms of total land operated. This is also true for each region (tables 12-15). Farms with large rice acreages are more diversified in terms of the types and amounts of crops grown. Rice farms in the Mississippi River Delta averaged 112 acres of rice and 1,200 acres operated in the smallest rice acreage class and exceeded 4,200 total acres operated in the largest rice acreage class (table 12). Rice, soybeans, cotton, and wheat were the primary crops grown on these farms. Farms in the Arkansas (non-Delta) region produced primarily rice, soybeans, and wheat, with average farm size ranging from 696 acres in the smallest rice acreage class to 1,968 acres in the largest class (table 13). Average rice acreage per farm for the three classes were 92, 230, and 600 acres, respectively. Rice and soybeans were the major crops grown on Gulf Coast rice farms with average farm sizes ranging from 403 to 2,176 acres (table 14). California rice farms produced primarily rice, although larger farms tended to diversify more (table 15).

^{1/} McElroy, Robert G. Major Statistical Series of the U.S. Department of Agriculture: Costs of Production, AH-671, Vol. 12, Econ. Res. Serv., U.S. Dept. Agr., Sept. 1987.

In every region, farms with larger acreages of rice devoted a larger percentage of their total land to rice production (tables 16-20). Farms in the Mississippi River Delta region, overall, planted a smaller percentage of their total operated land in rice, ranging from 9.3 percent on farms with 1-150 acres of rice to 21.1 percent on farms with 301 or more acres of rice. The largest difference in land devoted to rice production was observed in California, where farms in the largest rice acreage class planted 48.5 percent of their total land in rice, compared with 18.4 percent for farms in the smallest rice acreage class.

Only the Gulf Coast and California regions reported large differences in average rice yields per planted acre among size groups (tables 16-20). Yields averaged 5.6-7.4 cwt per acre higher on farms with 301 or more acres of rice in the Gulf Coast and as much as 11.6 cwt per acre higher in California. The Mississippi River Delta and Gulf Coast were the only two regions in which significant differences in rice-seeding rates among rice acreage classes were observed (table 21). Average nitrogen fertilization rates among rice acreage classes varied from region to region, but generally declined as rice acreage increased across all U.S. farms (table 22).

Tables 23-27 show the average value of farm assets, debt, and net worth for rice acreage classes in the United States and within each region. The debt/asset structure of U.S. rice farms was not significantly different across the rice acreage classes, with average debt/asset ratios ranging from 0.29 in the 301 or more acreage class to 0.34 in the 151-300 acreage class. Farms with 151-300 acres of rice reported the highest machinery investment per acre at \$140. Debt/asset ratios, on average, decreased as rice acreage increased in the Mississippi River Delta region, but increased in the Gulf Coast and California regions.

Average net cash farm income on large U.S. rice farms (more than 300 acres of rice) in 1984 was estimated to be \$74,369 (table 28). This level of income was substantially higher than average estimates for the two smaller rice acreage classes, \$42,640 and \$37,147 per farm, respectively. Net cash farm income per acre of land operated, however, was higher on farms with smaller acreages of rice. Farms with 150 acres of rice or less had an average net cash farm income of \$57 per acre of land operated, compared with \$34 per acre for farms in the 151 to 300 acre class and \$30 per acre in the 301 acres or more class. These estimates reflect income and expenses associated with all crop and livestock enterprises produced on the farm.

On a per acre basis, total farm operating expenses, less interest, increased as rice acreage increased in three of the four regions (tables 29-32). In the Mississippi River Delta region, total farm operating expenses, less interest, averaged \$103 per acre of land operated on farm with more than 300 acres of rice, compared with \$156 per acre on farm with 1-150 acres of rice and \$136 per acre on farms with 151-300 acres of rice. Interest expenses per acre generally increased on farms with larger acreages of rice, except in the Mississippi River Delta where mid-sized rice farms reported the highest average level of interest paid.

Table 33 shows the average number and size of tractors used in rice production on farms in each region. The average number of tractors for rice acreage classes within each region were not substantially different,

although farms with larger acreages of rice tended to use larger tractors. Two-wheel drive tractors were the most common type of tractor used in rice production, except in California where crawler tractors were more prevalent.

Implements listed in tables 34-37 represent the most common pieces of field equipment used in rice production, along with average size, tractor horsepower, and times-over. Within each region, rice farms in each rice acreage class generally use the same types of implements. Farms with larger rice acreages of rice tended to use larger implements pulled by larger tractors. Some comparisons can be made between rice acreage classes regarding times-over of field operations. For example, farms in the Gulf Coast region with 150 acres of rice or less tended to use land planes, disks, and plows more often on rice fields than farms with larger rice acreages. In the Mississippi River Delta region, farms with 150 acres of rice or less tended to use a drill more often in planting rice than farms in the larger rice acreage classes.

Summary

The estimated cost-of-production budgets for U.S. rice exhibits increasing cost as rice acreage increases. However, the direction of change in production costs varied across rice-producing regions. In the Mississippi River Delta region, average total cash expenses and total economic costs decreased, on both a per acre and a per cwt basis, as rice acreage increased and increased with larger rice acreages on farms in the Gulf Coast region. In the Arkansas (non-Delta) and California regions, farms with larger acreages of rice generally had lower estimated economic costs per acre. Receipts, less cash expenses, increased with larger rice acreages in the Mississippi River Delta and California regions and decreased with larger rice acreages in the Arkansas (non-Delta) and Gulf Coast regions.

U.S. farms with 150 acres of rice or less had an average farm size of 749 acres, compared with 2,437 acres for farms with more than 300 acres of rice. Predominant crops produced on rice farms varied from primarily rice on California farms to a combination of rice, soybeans, cotton, and wheat on Mississippi River Delta farms. However, within each region, farms with larger acreages of rice planted a larger proportion of their land in rice than farms with smaller rice acreages. Average rice seeding rates were very similar across rice acreage classes in the Arkansas (non-Delta) and California regions, but varied in the Mississippi River Delta and Gulf Coast regions. Significant yield differences between farms in each rice acreage class were observed in only two regions, the Gulf Coast and California.

The average debt/asset structure of U.S. rice farms in 1984 was very similar across rice acreage classes, with average debt/asset ratios in the 0.30-0.35 range. Rice farms with high debt/asset ratios varied across regions, from farms with small acreages of rice in the Mississippi River Delta region to farms with large rice acreages in the Gulf Coast region. Farms with larger acreages of rice generally tended to have higher average values of net cash farm income per farm in 1984, although this relationship varied somewhat from one region to another.

In terms of machinery and equipment used in rice production, no significant differences in number of tractors or types of implements used were observed between rice acreage classes within each region. However, farms with larger acreages of rice did tend to use larger equipment with relatively fewer times-over.

The procedure used in this study provides more information about input use and production practices than have been previously available. As a result, this study provides a starting point for more in-depth analysis concerning the economics of size. This study represents the initial phase of an ongoing research project in this area. Clearly, there is a need for more research in the areas of farm size and economies of size.

Table 1--United States: Average rice production costs
per planted acre by rice acreage class, 1984

	Rice acreage class		
	1-150 Dollars	151-300 Dollars	301+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	382.63	404.47	418.78
Total	382.63	404.47	418.78
Cash expenses:			
Variable:			
Seed	24.75	26.42	30.34
Fertilizer	42.00	33.37	38.54
Chemicals	8.68	3.75	4.82
Custom operations	38.90	46.12	51.39
Fuel and lube	10.13	11.71	11.28
Repairs	9.96	10.37	11.95
Drying	26.09	29.30	36.54
Technical services	2.93	3.56	2.89
Irrigation	33.06	31.56	26.44
Hired labor	11.60	18.76	28.69
Purchased water	2.81	4.46	7.98
Total variable expenses	210.91	219.38	250.86
Fixed:			
General farm overhead	26.11	22.63	24.56
Taxes and insurance	7.94	8.10	7.49
Interest (real estate)	10.23	26.46	23.51
Interest (nonreal estate)	29.89	39.24	32.68
Total fixed expenses	74.17	96.43	88.24
Total cash expenses	285.08	315.81	339.10
Receipts less cash expenses	97.55	88.66	76.68
Capital replacement	38.07	36.02	37.15
Total expenses and replacement costs			
excl. real estate interest	312.92	325.37	352.74
Total cash expenses and capital replacement costs	323.15	351.83	376.25
Receipts less cash expenses and capital replacement costs	59.48	52.64	42.53
Economic (full ownership) costs:			
Variable expenses	210.91	219.38	250.86
General farm overhead	26.11	22.63	24.56
Taxes and insurance	7.94	8.10	7.49
Capital replacement	38.07	36.02	37.15
Allocated returns to owned inputs:			
Return to operating capital	6.89	7.18	8.22
Return to other nonland capital	23.63	13.13	6.37
Net land rent	84.22	89.06	98.08
Unpaid labor	57.50	64.74	59.60
Total economic costs	455.27	460.24	492.33
Residual returns to management and risk	-72.64	-55.77	-73.55
Harvest-period price (dollars/cwt)	8.05	8.05	8.05
Yield (cwt/planted acre)	47.53	50.25	52.02

Table 2--United States: Average rice production costs
per hundredweight by rice acreage class, 1984 1/

	Rice acreage class		
	1-150 Dollars	151-300 Dollars	301+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	8.05	8.05	8.05
Total	8.05	8.05	8.05
Cash expenses:			
Variable:			
Seed	.52	.53	.58
Fertilizer	.88	.66	.74
Chemicals	.18	.07	.09
Custom operations	.82	.92	.99
Fuel and lube	.21	.23	.22
Repairs	.21	.21	.23
Drying	.55	.58	.70
Technical services	.06	.07	.06
Irrigation	.70	.63	.51
Hired labor	.24	.37	.55
Purchased water	.06	.09	.15
Total variable expenses	4.44	4.37	4.82
Fixed:			
General farm overhead	.55	.45	.47
Taxes and insurance	.17	.16	.14
Interest (real estate)	.21	.54	.45
Interest (nonreal estate)	.63	.78	.63
Total fixed expenses	1.56	1.92	1.69
Total cash expenses	6.00	6.29	6.52
Receipts less cash expenses	2.05	1.76	1.47
Capital replacement	.80	.72	.71
Total expenses and replacement costs			
excl. real estate interest	6.58	6.48	6.78
Total cash expenses and capital replacement costs	6.80	7.00	7.23
Receipts less cash expenses and capital replacement costs	1.25	1.05	.82
Economic (full ownership) costs:			
Variable expenses	4.44	4.37	4.82
General farm overhead	.55	.45	.47
Taxes and insurance	.17	.16	.14
Capital replacement	.80	.72	.71
Allocated returns to owned inputs:			
Return to operating capital	.15	.14	.16
Return to other nonland capital	.50	.26	.12
Net land rent	1.77	1.77	1.88
Unpaid labor	1.21	1.29	1.14
Total economic costs	9.58	9.16	9.46
Residual returns to management and risk	-1.53	-1.11	-1.41
Harvest-period price (dollars/cwt)	8.05	8.05	8.05
Yield (cwt/planted acre)	47.53	50.25	52.02

1/ Numbers may not add due to rounding.

Table 3--Mississippi River Delta: Average rice production costs per planted acre by rice acreage class, 1984

	Rice acreage class		
	1-150 Dollars	151-300 Dollars	301+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	354.27	362.52	362.42
Total	354.27	362.52	362.42
Cash expenses:			
Variable:			
Seed	21.49	30.52	30.47
Fertilizer	72.61	31.17	32.27
Chemicals	27.86	17.14	6.50
Custom operations	37.74	49.54	38.14
Fuel and lube	6.50	10.51	7.94
Repairs	7.35	11.78	11.28
Drying	34.26	31.47	33.51
Technical services	3.85	4.57	3.16
Irrigation	32.99	21.74	21.96
Hired labor	15.08	18.54	21.58
Purchased water	-	0.45	-
Total variable expenses	259.73	227.43	206.81
Fixed:			
General farm overhead	25.16	22.19	19.39
Taxes and insurance	5.64	7.57	5.69
Interest (real estate)	13.17	19.29	19.70
Interest (nonreal estate)	40.08	39.81	23.95
Total fixed expenses	84.05	88.86	68.73
Total cash expenses	343.78	316.29	275.54
Receipts less cash expenses	10.49	46.23	86.88
Capital replacement	36.08	29.48	35.72
Total expenses and replacement costs			
excl. real estate interest	366.69	326.48	291.56
Total cash expenses and capital replacement costs	379.86	345.77	311.26
Receipts less cash expenses and capital replacement costs	-25.59	16.75	51.16
Economic (full ownership) costs:			
Variable expenses	259.73	227.43	206.81
General farm overhead	25.16	22.19	19.39
Taxes and insurance	5.64	7.57	5.69
Capital replacement	36.08	29.48	35.72
Allocated returns to owned inputs:			
Return to operating capital	8.49	7.43	6.76
Return to other nonland capital	21.79	13.40	5.96
Net land rent	57.75	80.04	78.09
Unpaid labor	28.82	46.13	39.10
Total economic costs	443.46	433.67	397.52
Residual returns to management and risk	-89.19	-71.15	-35.10
Harvest-period price (dollars/cwt)	8.03	8.03	8.03
Yield (cwt/planted acre)	44.12	45.15	45.13

Table 4--Mississippi River Delta: Average rice production costs per hundredweight by rice acreage class, 1984 1/

	Rice acreage class		
	1-150 Dollars	151-300 Dollars	301+ Dollars
Cash receipts (excl. Gov't payments):			
Primary crop	8.03	8.03	8.03
Total	8.03	8.03	8.03
Cash expenses:			
Variable:			
Seed	.49	.68	.67
Fertilizer	1.65	.69	.71
Chemicals	.63	.38	.14
Custom operations	.86	1.10	.84
Fuel and lube	.15	.23	.18
Repairs	.17	.26	.25
Drying	.78	.70	.74
Technical services	.09	.10	.07
Irrigation	.75	.48	.49
Hired labor	.34	.41	.48
Purchased water	-	.01	-
Total variable expenses	5.89	5.04	4.58
Fixed:			
General farm overhead	.57	.49	.43
Taxes and insurance	.13	.17	.13
Interest (real estate)	.30	.43	.43
Interest (nonreal estate)	.91	.88	.53
Total fixed expenses	1.91	1.97	1.52
Total cash expenses	7.79	7.01	6.10
Receipts less cash expenses	.24	1.02	1.93
Capital replacement	.82	.65	.79
Total expenses and replacement costs			
excl. real estate interest	8.31	7.23	6.46
Total cash expenses and capital replacement costs	8.61	7.66	6.90
Receipts less cash expenses and capital replacement costs	-.58	.37	1.13
Economic (full ownership) costs:			
Variable expenses	5.89	5.04	4.58
General farm overhead	.57	.49	.43
Taxes and insurance	.13	.17	.13
Capital replacement	.82	.65	.79
Allocated returns to owned inputs:			
Return to operating capital	.19	.16	.15
Return to other nonland capital	.49	.30	.13
Net land rent	1.31	1.77	1.72
Unpaid labor	.65	1.02	.87
Total economic costs	10.05	9.61	8.81
Residual returns to management and risk	-2.02	-1.58	-.78
Harvest-period price (dollars/cwt)	8.03	8.03	8.03
Yield (cwt/planted acre)	44.12	45.15	45.13

1/ Numbers may not add due to rounding.

Table 5--Arkansas (non-Delta): Average rice production costs
per planted acre by rice acreage class, 1984

	Rice acreage class		
	1-150	151-300	301+
	Dollars		
Cash receipts (excl. Gov't payments):			
Primary crop	407.70	413.16	392.17
Total	407.70	413.16	392.17
Cash expenses:			
Variable:			
Seed	25.38	24.35	25.63
Fertilizer	25.74	29.81	31.11
Chemicals	1.02	0.70	1.19
Custom operations	36.28	39.14	42.38
Fuel and lube	11.55	11.99	10.40
Repairs	11.37	9.43	10.50
Drying	17.74	23.81	27.99
Technical services	2.99	4.51	3.84
Irrigation	36.13	40.44	30.83
Hired labor	9.58	16.09	21.62
Purchased water	-	-	1.49
Total variable expenses	177.78	200.27	206.98
Fixed:			
General farm overhead	23.49	20.94	19.07
Taxes and insurance	8.05	7.36	8.10
Interest (real estate)	11.52	29.48	21.09
Interest (nonreal estate)	25.55	42.94	23.32
Total fixed expenses	68.61	100.72	71.58
Total cash expenses	246.39	300.99	278.56
Receipts less cash expenses	161.31	112.20	113.61
Capital replacement	40.20	37.39	36.90
Total expenses and replacement costs	275.07	308.90	294.37
excl. real estate interest			
Total cash expenses and	286.59	338.38	315.46
capital replacement costs			
Receipts less cash expenses and			
capital replacement costs	121.11	74.78	76.71
Economic (full ownership) costs:			
Variable expenses	177.78	200.27	206.98
General farm overhead	23.49	20.94	19.07
Taxes and insurance	8.05	7.36	8.10
Capital replacement	40.20	37.39	36.90
Allocated returns to owned inputs:			
Return to operating capital	5.81	6.55	6.76
Return to other nonland capital	25.00	12.13	6.36
Net land rent	98.70	89.16	99.21
Unpaid labor	68.86	64.04	52.38
Total economic costs	447.89	437.84	435.76
Residual returns to management and risk	-40.19	-24.68	-43.59
Harvest-period price (dollars/cwt)	8.19	8.19	8.19
Yield (cwt/planted acre)	49.78	50.45	47.88

Table 6--Arkansas (non-Delta): Average rice production costs
per hundredweight by rice acreage class, 1984 1/

	Rice acreage class		
	1-150	151-300	301+
	Dollars		
Cash receipts (excl. Gov't payments):			
Primary crop	8.19	8.19	8.19
Total	8.19	8.19	8.19
Cash expenses:			
Variable:			
Seed	.51	.48	.53
Fertilizer	.52	.59	.65
Chemicals	.02	.01	.02
Custom operations	.73	.78	.88
Fuel and lube	.23	.24	.22
Repairs	.23	.19	.22
Drying	.36	.47	.58
Technical services	.06	.09	.08
Irrigation	.73	.80	.64
Hired labor	.19	.32	.45
Purchased water	-	-	.03
Total variable expenses	3.57	3.97	4.32
Fixed:			
General farm overhead	.47	.42	.40
Taxes and insurance	.16	.15	.17
Interest (real estate)	.23	.59	.44
Interest (nonreal estate)	.51	.85	.49
Total fixed expenses	1.38	2.00	1.50
Total cash expenses	4.95	5.97	5.82
Receipts less cash expenses	3.24	2.22	2.37
Capital replacement	.81	.74	.76
Total expenses and replacement costs	5.53	6.12	6.15
excl. real estate interest			
Total cash expenses and	5.76	6.71	6.59
capital replacement costs			
Receipts less cash expenses and			
capital replacement costs	2.43	1.48	1.60
Economic (full ownership) costs:			
Variable expenses	3.57	3.97	4.32
General farm overhead	.47	.42	.40
Taxes and insurance	.16	.15	.17
Capital replacement	.81	.74	.77
Allocated returns to owned inputs:			
Return to operating capital	.12	.13	.14
Return to other nonland capital	.50	.24	.13
Net land rent	1.98	1.77	2.07
Unpaid labor	1.38	1.27	1.09
Total economic costs	9.00	8.68	9.10
Residual returns to management and risk	-.81	-.49	-.91
Harvest-period price (dollars/cwt)	8.19	8.19	8.19
Yield (cwt/planted acre)	49.78	50.45	47.88

1/ Numbers may not add due to rounding.

Table 7--Gulf Coast: Average rice production costs
per planted acre by rice acreage class, 1984

	Rice acreage class		
	1-150	151-300	301+
Dollars			
Cash receipts (excl. Gov't payments):			
Primary crop	350.28	364.48	410.95
Total	350.28	364.48	410.95
Cash expenses:			
Variable:			
Seed	27.14	27.29	33.11
Fertilizer	35.57	40.67	46.54
Chemicals	0.82	1.58	5.39
Custom operations	31.95	50.53	55.48
Fuel and lube	12.89	12.96	15.06
Repairs	9.87	10.86	12.66
Drying	38.81	37.32	39.63
Technical services	0.65	0.66	3.31
Irrigation	26.66	25.53	35.85
Hired labor	7.99	12.09	22.52
Purchased water	14.09	15.45	17.29
Total variable expenses	206.44	234.94	286.84
Fixed:			
General farm overhead	29.13	19.24	26.99
Taxes and insurance	12.10	10.54	9.14
Interest (real estate)	1.25	9.90	21.05
Interest (nonreal estate)	27.78	25.75	35.82
Total fixed expenses	70.26	65.43	93.00
Total cash expenses	276.70	300.37	379.84
Receipts less cash expenses	73.58	64.11	31.11
Capital replacement	36.28	37.45	40.11
Total expenses and replacement costs excl. real estate interest	311.73	327.92	398.90
Total cash expenses and capital replacement costs	312.98	337.82	419.95
Receipts less cash expenses and capital replacement costs	37.30	26.66	-9.00
Economic (full ownership) costs:			
Variable Expenses	206.44	234.94	286.84
General farm overhead	29.13	19.24	26.99
Taxes and insurance	12.10	10.54	9.14
Capital replacement	36.28	37.45	40.11
Allocated returns to owned inputs:			
Return to operating capital	6.75	7.68	9.44
Return to other nonland capital	20.31	10.93	5.70
Net land rent	72.03	72.06	86.35
Unpaid labor	63.66	87.63	81.27
Total economic costs	446.70	480.47	545.84
Residual returns to management and risk	-96.42	-115.99	-134.89
Harvest-period price (dollars/cwt)	8.23	8.23	8.23
Yield (cwt/planted acre)	42.56	44.29	49.93

Table 8--Gulf Coast: Average rice production costs
per hundredweight by rice acreage class, 1984 1/

	Rice acreage class		
	1-150	151-300	301+
Dollars			
Cash receipts (excl. Gov't payments):			
Primary crop	8.23	8.23	8.23
Total	8.23	8.23	8.23
Cash expenses:			
Variable:			
Seed	.64	.62	.66
Fertilizer	.84	.92	.93
Chemicals	.02	.04	.11
Custom operations	.75	1.14	1.11
Fuel and lube	.30	.29	.30
Repairs	.23	.25	.25
Drying	.91	.84	.79
Technical services	.02	.01	.07
Irrigation	.63	.58	.72
Hired labor	.19	.27	.45
Purchased water	.33	.35	.35
Total variable expenses	4.85	5.30	5.74
Fixed:			
General farm overhead	.68	.43	.54
Taxes and insurance	.28	.24	.18
Interest (real estate)	.03	.22	.42
Interest (nonreal estate)	.65	.58	.72
Total fixed expenses	1.65	1.48	1.86
Total cash expenses	6.50	6.78	7.61
Receipts less cash expenses	1.73	1.45	.62
Capital replacement	.85	.85	.80
Total expenses and replacement costs excl. real estate interest	7.32	7.40	7.99
Total cash expenses and capital replacement costs	7.35	7.63	8.41
Receipts less cash expenses and capital replacement costs	.88	.60	-.18
Economic (full ownership) costs:			
Variable expenses	4.85	5.30	5.74
General farm overhead	.68	.43	.54
Taxes and insurance	.28	.24	.18
Capital replacement	.85	.85	.80
Allocated returns to owned inputs:			
Return to operating capital	.16	.17	.19
Return to other nonland capital	.48	.25	.11
Net land rent	1.69	1.63	1.73
Unpaid labor	1.50	1.98	1.63
Total economic costs	10.50	10.85	10.93
Residual returns to management and risk	-2.27	-2.62	-2.70
Harvest-period price (dollars/cwt)	8.23	8.23	8.23
Yield (cwt/planted acre)	42.56	44.29	49.93

1/ Numbers may not add due to rounding.

Table 9--California: Average rice production costs
per planted acre by rice acreage class, 1984

	Rice acreage class		
	1-150	151-300	301+
	Dollars		
Cash receipts (excl. Gov't payments):			
Primary crop	454.27	527.48	542.60
Total	454.27	527.48	542.60
Cash expenses:			
Variable:			
Seed	31.14	30.02	31.54
Fertilizer	75.18	42.94	42.63
Chemicals	6.41	4.00	6.48
Custom operations	114.65	72.13	74.55
Fuel and lube	5.95	9.51	10.10
Repairs	9.50	12.50	13.57
Drying	38.86	41.49	46.80
Technical services	3.75	2.25	0.44
Irrigation	12.29	8.20	9.22
Hired labor	29.21	47.77	59.67
Purchased water	22.88	14.90	10.77
Total variable expenses	349.82	285.71	305.77
Fixed:			
General farm overhead	61.22	39.80	34.77
Taxes and insurance	7.76	8.39	6.06
Interest (real estate)	3.18	53.50	36.67
Interest (nonreal estate)	24.76	43.69	51.85
Total fixed expenses	96.92	145.38	129.35
Total cash expenses	446.74	431.09	435.12
Receipts less cash expenses	7.53	96.39	107.48
Capital replacement	28.39	35.85	33.98
Total expenses and replacement costs			
excl. real estate interest	471.95	413.44	432.43
Total cash expenses and capital replacement costs	475.13	466.94	469.10
Receipts less cash expenses and capital replacement costs	-20.86	60.54	73.50
Economic (full ownership) costs:			
Variable expenses	349.82	285.71	305.77
General farm overhead	61.22	39.80	34.77
Taxes and insurance	7.76	8.39	6.06
Capital replacement	28.39	35.85	33.98
Allocated returns to owned inputs:			
Return to operating capital	11.43	9.45	9.99
Return to other nonland capital	30.31	22.82	8.20
Net land rent	118.55	136.75	145.83
Unpaid labor	84.14	53.53	57.84
Total economic costs	691.62	592.30	602.44
Residual returns to management and risk	-237.35	-64.82	-59.84
Harvest-period price (dollars/cwt)	7.63	7.63	7.63
Yield (cwt/planted acre)	59.54	69.13	71.11

Table 10--California: Average rice production costs
per hundredweight by rice acreage class, 1984 1/

	Rice acreage class		
	1-150	151-300	301+
	Dollars		
Cash receipts (excl. Gov't payments):			
Primary crop	7.63	7.63	7.63
Total	7.63	7.63	7.63
Cash expenses:			
Variable:			
Seed	.52	.43	.44
Fertilizer	1.26	.62	.60
Chemicals	.11	.06	.09
Custom operations	1.93	1.04	1.05
Fuel and lube	.10	.14	.14
Repairs	.16	.18	.19
Drying	.65	.60	.66
Technical services	.06	.03	.01
Irrigation	.21	.12	.13
Hired labor	.49	.69	.84
Purchased water	.38	.22	.15
Total variable expenses	5.88	4.13	4.30
Fixed:			
General farm overhead	1.03	.58	.49
Taxes and insurance	.13	.12	.09
Interest (real estate)	.05	.77	.51
Interest (nonreal estate)	.42	.63	.73
Total fixed expenses	1.63	2.10	1.82
Total cash expenses	7.50	6.24	6.12
Receipts less cash expenses	.13	1.39	1.51
Capital replacement	.48	.52	.48
Total expenses and replacement costs			
excl. real interest	7.93	5.98	6.09
Total cash expenses and capital replacement costs	7.98	6.75	6.60
Receipts less cash expenses and capital replacement costs	-.35	.88	1.03
Economic (full ownership) costs:			
Variable expenses	5.88	4.13	4.30
General farm overhead	1.03	.58	.49
Taxes and insurance	.13	.12	.09
Capital replacement	.48	.52	.48
Allocated returns to owned inputs:			
Return to operating capital	.19	.13	.14
Return to other nonland capital	.51	.33	.12
Net land rent	1.99	1.98	2.05
Unpaid labor	1.41	.77	.81
Total economic costs	11.62	8.57	8.47
Residual returns to management and risk	-3.99	-.94	-.84
Harvest-period price (dollars/cwt)	7.63	7.63	7.63
Yield (cwt/planted acre)	59.54	69.13	71.11

1/ Numbers may not add due to rounding.

Table 11--United States: Average land use and tenure on rice farms
by rice acreage class, 1984 1/

Land	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Acres</u>		
Owned	138	327	958
Rented:			
Cash	158	213	442
Share	456	454	1,183
Free	1	138	8
Rented out	4	28	154
Total operated	749	1,104	2,437
Planted acreage:			
Rice	94	230	723
Barley	0	2	1
Corn	1	8	16
Cotton	34	20	80
Oats	1	1	2
Peanuts	0	1	0
Sorghum	32	62	57
Soybeans	460	471	942
Sugarbeets	0	4	1
Sunflowers	0	1	1
Vegetables	1	3	7
Wheat			
Pasture	22	65	171

1/ Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 12--Mississippi River Delta: Average land use and tenure on rice farms
by rice acreage class, 1984 1/

Land	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Acres</u>		
Owned	296	438	1,771
Rented:			
Cash	481	765	651
Share	428	523	1,940
Free	0	0	1
Rented out	5	76	86
Total operated	1,200	1,650	4,276
Planted acreage:			
Rice	112	224	902
Corn	0	0	1
Cotton	127	96	351
Oats	0	0	1
Sorghum	96	69	88
Soybeans	631	1,086	2,479
Sunflowers	0	0	2/
Wheat	188	244	802
Pasture	1	11	17

1/ Numbers may not add due to rounding.

2/ Average is less than 1.0.

Source: 1984 Farm Costs and Returns Survey.

Table 13--Arkansas (non-Delta): Average land use and tenure on rice farms
by rice acreage class, 1984 1/

Land	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Acres</u>		
Owned	84	250	802
Rented:			
Cash	48	92	128
Share	566	440	1,037
Free	1	244	5
Rented out	3	10	4
Total operated	696	1,016	1,968
Planted acreage:			
Rice	92	230	600
Corn	<u>2/</u>	0	10
Cotton	7	0	9
Oats	0	2	0
Sorghum	11	76	50
Soybeans	505	437	971
Wheat	103	215	334
Pasture	14	11	0

1/ Numbers may not add due to rounding.

2/ Average is less than 1.0.

Source: 1984 Farm Costs and Returns Survey.

Table 14--Gulf Coast: Average land use and tenure on rice farms
by rice acreage class, 1984 1/

Land	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Acres</u>		
Owned	65	176	507
Rented:			
Cash	95	188	644
Share	249	523	1,149
Free	1	9	20
Rented out	7	5	143
Total operated	403	891	2,176
Planted acreage:			
Rice	81	235	699
Corn	7	10	21
Cotton	0	0	23
Oats	0	2	4
Peanuts	0	5	0
Sorghum	17	46	60
Soybeans	203	285	482
Wheat	10	19	36
Pasture	45	128	380

1/ Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 15--California: Average land use and tenure on rice farms
by rice acreage class, 1984 ^{1/}

Land	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Acres</u>		
Owned	227	887	1,196
Rented:			
Cash	78	38	338
Share	56	283	608
Free	0	1	0
Rented out	2	94	529
Total operated	359	1,115	1,613
Planted acreage:			
Rice	66	232	782
Barley	0	16	6
Corn	0	61	33
Cotton	0	45	0
Oats	17	0	<u>2/</u>
Sorghum	5	0	24
Sugarbeets	0	39	8
Sunflowers	0	11	4
Vegetables	27	35	45
Wheat	15	105	87
Pasture	134	342	232

^{1/} Numbers may not add due to rounding.

^{2/} Average is less than 1.0.

Source: 1984 Farm Costs and Returns Survey.

Table 16--United States: Average rice yields and degree of specialization on rice farms by rice acreage class, 1984

Item	Unit	Rice acreage class		
		150 acres or less	151-300 acres	301 acres or more
Acreage:				
Rice	Acres	94	230	723
Total farm	Acres	749	1,104	2,437
Rice acreage as a share of farm acreage	Percent	12.6	20.8	29.7
Rice yield per planted acre	Cwt	47.53	50.24	52.02

Source: 1984 Farm Costs and Returns Survey.

Table 17--Mississippi River Delta: Average rice yields and degree of specialization on rice farms by rice acreage class, 1984

Item	Unit	Rice acreage class		
		150 acres or less	151-300 acres	301 acres or more
Acreage:				
Rice	Acres	112	224	902
Total farm	Acres	1,200	1,650	4,276
Rice acreage as a share of farm acreage	Percent	9.3	13.6	21.1
Rice yield per planted acre	Cwt	44.12	45.15	45.13

Source: 1984 Farm Costs and Returns Survey.

Table 18--Arkansas (non-Delta): Average rice yields and degree of specialization on rice farms by rice acreage class, 1984

Item	Unit	Rice acreage class		
		150 acres or less	151-300 acres	301 acres or more
Acreage:				
Rice	Acres	92	230	600
Total farm	Acres	696	1,016	1,968
Rice acreage as a share of farm acreage	Percent	13.2	22.6	30.5
Rice yield per planted acre	Cwt	49.78	50.45	47.88

Source: 1984 Farm Costs and Returns Survey.

Table 19--Gulf Coast: Average rice yields and degree of specialization on rice farms by rice acreage class, 1984

Item	Unit	Rice acreage class		
		150 acres or less	151-300 acres	301 acres or more
Acreage:				
Rice	Acres	81	235	699
Total farm	Acres	403	891	2,176
Rice acreage as a share of farm acreage	Percent	20.1	26.4	32.1
Rice yield per planted acre	Cwt	42.56	44.29	49.93

Source: 1984 Farm Costs and Returns Survey.

Table 20--California: Average rice yields and degree of specialization on rice farms by rice acreage class, 1984

Item	Unit	Rice acreage class		
		150 acres or less	151-300 acres	301 acres or more
Acreage:				
Rice	Acres	66	232	782
Total farm	Acres	359	1,115	1,613
Rice acreage as a share of farm acreage	Percent	18.4	20.8	48.5
Rice yield per planted acre	Cwt	59.54	69.13	71.11

Source: 1984 Farm Costs and Returns Survey.

Table 21--Average rice seeding rates on farms by rice acreage class and region, 1984

Region	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Pounds per acre</u>		
Mississippi River Delta	113	161	160
Arkansas (non-Delta)	134	128	135
Gulf Coast	143	144	174
California	164	158	166
United States	130	139	160

Source: 1984 Farm Costs and Returns Survey.

Table 22--Average rice fertilization rates on farms by rice acreage class and region, 1984

Region and fertilizer	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Pounds per acre</u>		
Mississippi River Delta:			
Nitrogen	D	128	132
Phosphate	3	2	1
Potash	3	1	4
Arkansas (non-Delta):			
Nitrogen	94	120	104
Phosphate	8	3	7
Potash	14	7	18
Gulf Coast:			
Nitrogen	88	100	117
Phosphate	46	53	44
Potash	32	40	31
California:			
Nitrogen	146	91	88
Phosphate	65	42	41
Potash	0	5	1
United States:			
Nitrogen	151	115	112
Phosphate	14	16	24
Potash	13	12	16

D = Insufficient data for disclosure.

Source: 1984 Farm Costs and Returns Survey.

Table 23--United States: Average value of farm assets, debt, and net worth on rice farms by rice acreage class, January 1, 1985 ^{1/}

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	164,821	393,376	1,131,739
Trucks and automobiles	13,524	25,072	31,484
Tractors	31,879	52,678	117,050
Other equipment	41,029	76,701	146,283
Livestock and poultry	2,617	4,611	8,803
Purchased inputs on hand	871	5,718	2,074
Crops stored on/off farm	24,129	76,996	134,173
Total	278,870	635,153	1,571,606
Total farm debt	85,504	213,029	456,575
Total net worth	193,366	422,123	1,115,032
Debt/asset ratio	.31	.34	.29
	<u>Dollars per acre</u>		
Machinery investment	115	140	121
Assets	372	575	645
Debt	114	193	187
Net worth	258	382	458

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 24--Mississippi River Delta: Average value of farm assets, debt, and net worth on rice farms by rice acreage class, January 1, 1985 ^{1/}

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	319,611	484,882	1,161,077
Trucks and automobiles	29,201	35,426	44,591
Tractors	71,218	74,179	125,476
Other equipment	86,020	132,245	161,621
Livestock and poultry	1,896	4,628	8,510
Purchased inputs on hand	1,302	310	780
Crops stored on/off farm	29,047	113,148	179,226
Total	538,295	844,819	1,681,281
Total farm debt	233,000	319,861	532,093
Total net worth	305,294	524,958	1,149,188
Debt/asset ratio	.43	.38	.32
	<u>Dollars per acre</u>		
Machinery investment	155	147	78
Assets	449	512	393
Debt	194	194	124
Net worth	254	318	269

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 25--Arkansas (non-Delta): Average value of farm assets, debt, and net worth on rice farms by rice acreage class, January 1, 1985 ^{1/}

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	109,865	228,627	1,310,407
Trucks and automobiles	7,593	25,229	24,666
Tractors	16,221	44,116	124,322
Other equipment	27,071	66,692	122,692
Livestock and poultry	2,507	4,297	0
Purchased inputs on hand	223	9,385	275
Crops stored on/off farm	24,205	89,027	136,966
Total	187,684	467,373	1,719,328
Total farm debt	40,281	173,222	344,760
Total net worth	147,403	294,151	1,374,568
Debt/asset ratio	.21	.37	.20
	<u>Dollars per acre</u>		
Machinery investment	73	134	138
Assets	270	460	874
Debt	58	170	175
Net worth	212	290	698

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 26--Gulf Coast: Average value of farm assets, debt, and net worth on rice farms by rice acreage class, January 1, 1985 ^{1/}

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	85,272	272,892	688,572
Trucks and automobiles	11,539	17,310	28,990
Tractors	29,313	45,819	102,936
Other equipment	25,359	49,958	120,991
Livestock and poultry	1,629	7,884	15,541
Purchased inputs on hand	28	1,948	638
Crops stored on/off farm	22,818	39,104	110,420
Total	175,958	434,915	1,068,086
Total farm debt	27,471	119,964	423,803
Total net worth	148,487	314,951	644,283
Debt/asset ratio	.16	.28	.40
	<u>Dollars per acre</u>		
Machinery investment	164	127	116
Assets	437	488	491
Debt	68	135	195
Net worth	368	353	296

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 27--California: Average value of farm assets, debt, and net worth on rice farms by rice acreage class, January 1, 1985 ^{1/}

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Assets:			
Land and buildings	302,338	1,435,463	1,692,555
Trucks and automobiles	12,192	22,017	33,190
Tractors	29,322	79,968	123,090
Other equipment	35,505	94,349	222,626
Livestock and poultry	10,250	0	11,033
Purchased inputs on hand	8,611	812	9,829
Crops stored on/off farm	4,850	20,608	124,303
Total	403,067	1,653,217	2,216,625
Total farm debt	82,670	448,202	634,788
Total net worth	320,398	1,205,014	1,581,837
Debt/asset ratio	.21	.27	.29
	<u>Dollars per acre</u>		
Machinery investment	215	176	235
Assets	1,123	1,483	1,374
Debt	230	402	394
Net worth	892	1,081	981

^{1/} Numbers may not add due to rounding.

Source: 1984 Farm Costs and Returns Survey.

Table 28--United States: Average farm income and expenses
on rice farms by rice acreage class, 1984 1/

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	126,912	191,033	442,526
Government payments	12,058	20,233	36,225
Other	2,749	6,946	23,720
Total	141,719	218,212	502,471
Operating expenses:			
Fertilizer and lime	14,483	25,816	54,935
Chemicals	10,645	16,842	42,019
Paid labor	6,556	16,244	48,938
Custom work	2,011	3,000	10,049
Interest on--			
Real estate debt	3,426	12,345	28,649
Nonreal estate debt	7,517	16,803	36,155
Other	54,441	90,015	207,357
Total	99,079	181,065	428,102
Net cash farm income	42,640	37,147	74,369
Off-farm income	3,736	6,740	6,116
Total family income	46,376	43,887	80,485
	<u>Dollars per acre</u>		
Gross farm income	189	198	206
Operating expenses <u>3/</u>	118	138	149
Interest	15	26	27
Net cash farm income	57	34	30

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 29--Mississippi River Delta: Average farm income and expenses
on rice farms by rice acreage class, 1984 1/

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	185,796	286,988	582,368
Government payments	20,258	14,469	32,590
Other	2,830	8,362	13,274
Total	208,884	309,819	628,232
Operating expenses:			
Fertilizer and lime	27,796	32,467	61,183
Chemicals	26,587	22,762	61,343
Paid labor	16,783	26,019	71,797
Custom work	4,740	4,822	10,135
Interest on--			
Real estate debt	7,812	17,442	48,491
Nonreal estate debt	18,518	27,868	47,165
Other	111,610	137,624	233,972
Total	213,846	269,004	534,086
Net cash farm income	-4,962	40,815	94,146
Off-farm income	1,854	3,306	8,794
Total family income	-3,108	44,121	102,940
	<u>Dollars per acre</u>		
Gross farm income	174	188	147
Operating expenses <u>3/</u>	156	136	103
Interest	22	27	22
Net cash farm income	-4	25	22

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 30--Arkansas (non-Delta): Average farm income and expenses
on rice farms by rice acreage class, 1984 1/

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	128,819	160,634	336,898
Government payments	10,898	22,178	27,257
Other	2,172	3,698	3,342
Total	141,889	186,510	367,497
Operating expenses:			
Fertilizer and lime	10,738	24,562	45,655
Chemicals	6,125	13,798	31,929
Paid labor	3,235	12,733	34,685
Custom work	718	171	5,887
Interest on--			
Real estate debt	2,758	8,701	21,210
Nonreal estate debt	4,317	14,870	21,774
Other	38,926	74,077	137,953
Total	66,817	148,912	299,093
Net cash farm income	75,072	37,598	68,404
Off-farm income	3,922	4,655	4,496
Total family income	78,994	42,253	72,900
	<u>Dollars per acre</u>		
Gross farm income	204	183	187
Operating expenses <u>3/</u>	86	123	130
Interest	10	23	22
Net cash farm income	108	37	35

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 31--Gulf Coast: Average farm income and expenses
on rice farms by rice acreage class, 1984 1/

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	52,363	125,884	320,350
Government payments	4,857	14,912	37,430
Other	3,500	3,532	38,965
Total	60,720	144,328	396,745
Operating expenses:			
Fertilizer and lime	10,343	22,026	53,110
Chemicals	5,059	19,797	37,081
Paid labor	3,342	8,738	37,223
Custom work	1,115	2,471	7,340
Interest on--			
Real estate debt	333	5,012	18,000
Nonreal estate debt	3,630	10,197	31,910
Other	29,225	96,001	203,346
Total	53,047	144,242	388,010
Net cash farm income	7,673	86	8,735
Off-farm income	5,318	11,673	4,187
Total family income	12,991	11,759	12,922
	<u>Dollars per acre</u>		
Gross farm income	151	162	182
Operating expenses <u>3/</u>	122	145	155
Interest	10	17	23
Net cash farm income	19	0	4

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 32--California: Average farm income and expenses
on rice farms by rice acreage class, 1984 1/

Item	Rice acreage class		
	150 acres or less	151-300 acres	301 acres or more
	<u>Dollars</u>		
Farm income:			
Crop and livestock sales <u>2/</u>	71,621	334,967	717,525
Government payments	9,779	28,973	54,202
Other	6,272	30,169	41,314
Total	87,672	394,109	813,041
Operating expenses:			
Fertilizer and lime	7,097	29,402	67,899
Chemicals	4,164	18,870	47,207
Paid labor	5,817	35,015	71,394
Custom work	6,351	17,462	23,033
Interest on--			
Real estate debt	318	39,383	40,270
Nonreal estate debt	4,028	22,469	57,602
Other	40,102	130,567	308,437
Total	67,877	293,168	615,842
Net cash farm income	19,795	100,941	197,199
Off-farm income	5,354	14,971	9,811
Total family income	25,149	115,912	207,010
	<u>Dollars per acre</u>		
Gross farm income	244	353	504
Operating expenses <u>3/</u>	177	207	321
Interest	12	55	61
Net cash farm income	55	90	122

1/ Numbers may not add due to rounding.

2/ Value of CCC loans included in crop sales.

3/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 33--Tractors: Average number and horsepower on rice farms
by rice acreage class and region, 1984

Item	Rice acreage class					
	150 acres or less		151-300 acres		301 acres or more	
	<u>Number</u>	<u>Horse- power 1/</u>	<u>Number</u>	<u>Horse- power 1/</u>	<u>Number</u>	<u>Horse- power 1/</u>
Mississippi River Delta:						
Two-wheel drive	3.1	139	2.6	137	3.6	135
Four-wheel drive	.4	154	.9	162	1.7	213
Crawler	--	--	<u>2/</u>	33	<u>2/</u>	188
Four-wheel assist	.2	198	.2	227	.1	164
Arkansas (non-Delta):						
Two-wheel drive	3.2	125	3.1	130	3.6	164
Four-wheel drive	<u>2/</u>	193	.8	201	1.4	203
Crawler	--	--	<u>2/</u>	145	<u>2/</u>	37
Four-wheel assist	<u>2/</u>	85	<u>2/</u>	85	.1	197
Gulf Coast:						
Two-wheel drive	2.5	120	3.1	113	3.2	115
Four-wheel drive	.3	127	.6	170	1.9	183
Crawler	--	--	--	--	.1	76
Four-wheel assist	.2	205	.1	65	.1	238
California:						
Two-wheel drive	.6	99	.8	104	.9	90
Four-wheel drive	.6	169	.8	185	.9	195
Crawler	.9	135	1.8	172	2.7	172
Four-wheel assist	--	--	<u>2/</u>	85	.1	133
United States:						
Two-wheel drive	2.9	128	2.8	127	3.0	125
Four-wheel drive	.2	154	.8	188	1.5	196
Crawler	.1	135	.2	169	.5	165
Four-wheel assist	.1	171	.1	150	.1	195

-- = Not applicable.

1/ Power take-off horsepower.

2/ Average is less than 0.1.

Source: 1984 Farm Costs and Returns Survey.

Table 34--Mississippi River Delta: Average size, horsepower, and times-over of implements used in rice production by rice acreage class, 1984

Rice acreage class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
150 acres or less:			
Tandem disk, regular	20.8	156	1.34
Land plane	16.7	178	1.05
Drill, plain	19.7	153	.95
Combine, two-wheel drive	19.5	1/	.81
Field cultivator	25.5	157	.32
Levee plow	5.0	137	.31
Broadcast seeder	9.7	121	.20
Roller packer	24.9	111	.10
Offset, heavy duty disk	21.0	150	.09
Finishing harrow	20.9	150	.09
151-300 acres:			
Tandem disk, regular	21.3	166	1.18
Field cultivator	25.5	164	.74
Land plane	15.6	153	.59
Field conditioner	22.0	135	.52
Levee plow	7.4	148	.51
Roller packer	13.8	178	.42
Offset, heavy duty disk	22.1	166	.41
Drill, plain	18.9	145	.37
Combine, four-wheel drive	20.7	1/	.34
Broadcast seeder	14.4	131	.32
301 acres or more:			
Tandem disk, regular	23.6	189	.90
Drill, plain	21.4	150	.71
Land plane	20.1	193	.70
Field cultivator	30.9	188	.58
Combine, two-wheel drive	19.5	1/	.54
Combine, four-wheel drive	19.3	1/	.43
Drill, no-till	20.3	138	.40
Roller packer	19.7	175	.27
Spiketooth harrow	24.4	166	.16
Levee plow	7.2	138	.16

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

Table 35--Arkansas (non-Delta): Average size, horsepower, and times-over of implements used in rice production by rice acreage class, 1984

Rice acreage class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
150 acres or less:			
Tandem disk, regular	19.2	145	2.12
Levee plow	7.5	141	1.23
Land plane	14.7	130	.88
Field cultivator	21.3	155	.87
Float	13.8	143	.84
Combine two-wheel drive	16.9	1/	.82
Drill, plain	16.0	103	.82
Broadcast seeder	11.9	96	.57
Finishing harrow	20.0	150	.33
Roller packer	18.5	124	.25
151-300 acres:			
Tandem disk, regular	22.0	175	3.17
Field cultivator	27.8	180	1.11
Cultipacker	12.7	214	.80
Land plane	19.0	179	.76
Broadcast seeder	31.7	136	.64
Levee plow	10.9	146	.57
Combine, two-wheel drive	18.5	1/	.47
Roller packer	19.1	201	.47
Combine, combination	20.0	1/	.37
Drill, plain	18.6	150	.28
301 acres or more:			
Tandem disk, regular	26.1	194	1.34
Land plane	33.5	195	.88
Drill, plain	21.0	139	.81
Levee plow	8.7	166	.77
Field cultivator	34.3	201	.70
Combine, two-wheel drive	18.9	1/	.68
Landall	19.0	143	.53
Combine, four-wheel drive	19.3	1/	.35
Float	16.8	198	.30
Broadcast seeder	24.0	125	.23

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

Table 36--Gulf Coast: Average size, horsepower, and times-over of implements used in rice production by rice acreage class, 1984

Rice acreage class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
150 acres or less:			
Land plane	16.9	152	.77
Combine, two-wheel drive	15.9	1/	.74
Tandem disk, regular	18.0	155	.55
Levee plow	8.2	140	.53
Tandem disk plow	18.0	155	.55
Offset, heavy duty disk	11.4	125	.34
Disk plow	15.9	127	.34
Ditcher	2.1	94	.26
Springtooth harrow	19.7	137	.21
Field cultivator	23.7	144	.19
151-300 acres:			
Tandem disk, regular	18.9	159	.90
Combine, two-wheel drive	16.7	1/	.90
Land plane	19.0	167	.57
Ditcher	2.7	82	.54
Levee plow	9.4	141	.50
Field cultivator	24.8	160	.42
Tandem disk plow	15.3	140	.28
Subsoil plow	19.4	161	.27
Drill, plain	14.9	120	.25
Offset, heavy duty disk	14.1	158	.24
301 acres or more:			
Tandem disk plow	19.8	177	.89
Field cultivator	26.3	176	.89
Combine, two-wheel drive	16.3	1/	.68
Land plane	20.5	185	.50
Offset, heavy duty disk	17.8	185	.47
Combine, four-wheel drive	18.8	1/	.43
Drill, plain	19.2	128	.34
Springtooth harrow	24.2	148	.34
Ditcher	2.6	126	.29
Spiketooth harrow	21.1	144	.25

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

Table 37--California: Average size, horsepower, and times-over of implements used in rice production by rice acreage class, 1984

Rice acreage class and implement	Size	Tractor horsepower	Times-over
	<u>Feet</u>	- - - - - <u>Number</u> - - - - -	
150 acres or less:			
Land plane	15.1	167	.97
Combine, track	16.6	1/	.65
Chisel plow	16.0	137	.46
Offset, light duty disk	16.2	123	.36
Disk chisel	14.8	141	.31
Hipper disk	18.0	232	.29
Tandem disk, regular	19.0	161	.23
Offset, heavy duty disk	17.3	178	.21
Fert. appl., tractor mtd.	19.7	182	.20
Spiketooth harrow	16.0	104	.17
151-300 acres:			
Chisel plow	17.0	175	1.07
Land plane	17.2	170	.89
Offset, heavy duty disk	18.5	185	.88
Combine, track	17.2	1/	.77
Offset, light duty disk	19.2	173	.48
Spiketooth harrow	24.5	179	.37
Tandem disk, regular	19.1	214	.35
Fert. appl., tractor mtd.	21.2	129	.33
Combine, combination	19.5	1/	.19
300 acres or more:			
Land plane	18.6	179	1.07
Chisel plow	18.3	177	.91
Offset, heavy duty disk	20.0	180	.83
Combine, track	16.4	1/	.56
Tandem disk, regular	19.2	157	.51
Liquid fert. appl., trail. mtd.	19.4	136	.38
Combine, combination	19.2	1/	.29
Offset, light duty disk	18.7	182	.23
One way disk	18.0	191	.18
Liquid fert. appl., trac. mtd.	20.5	158	.16

1/ Self-propelled.

Source: 1984 Farm Costs and Returns Survey.

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DISTRIBUTION OF U.S. RICE FARMS AND PRODUCTION BY
PRODUCTION COSTS PER HUNDREDWEIGHT, 1984

Michael Salassi

How a producer evaluates whether to grow more or less of a crop, whether to produce a particular crop as opposed to another, or whether to participate in government commodity programs depends heavily on the costs of producing crops. Costs vary widely from farm to farm and region to region. Farm size, crop yield, machinery investment, production practices, and managerial ability all play a significant role in determining the level of production costs on a particular farm. The distribution of production costs across farms then becomes important in examining which areas of the country and what types and sizes of farms may be affected by changes in the prices paid for production inputs or by changes in the prices received for commodities.

This paper presents information on the distribution of rice farms and rice production by production costs per hundredweight, as well as the structural and financial characteristics of these farms. Cost distributions are estimated for each major rice-producing region and the United States. Data from the 1984 Farm Costs and Returns Survey (FCRS) are used along with a farm-level budget generator computer model to estimate individual rice cost-of-production (COP) budgets for each farm observation. These COP budgets are then expanded to represent all rice farms in each region in order to estimate the amount of rice grown and the corresponding number of rice farms represented at each level of cost. Characteristics of farms with rice costs of production above and below regional averages are also presented.

Methodology

USDA and many universities estimate commodity costs of production using some form of a computer program commonly called a budget generator. This computer model typically estimates per acre cost-of-production budgets for each commodity based upon input data supplied by the researcher. These input data have primarily consisted of average estimates of input use, input prices, and other factors that have been compiled from survey data or other sources. The resulting budget is then assumed to represent the average cost of production for a particular area. One problem encountered in using this procedure is that, although we obtain an average estimate of the production cost for a particular commodity, we have no information about the distribution of production costs around that mean.

The Economic Research Service (ERS) is currently developing a computer model that applies the principles of an aggregate budget generator program to individual survey observations. We can estimate COP budgets for each farm using its specific production practice information with this model. For example, seed, fertilizer, and chemical costs are

Salassi is an agricultural economist in the Farm Sector Financial Analysis Branch, Agriculture and Rural Economy Division, ERS, USDA.

calculated using the actual application rates reported by each farm. Machinery costs are based upon the actual pieces of machinery used in producing a farm's rice crop, rather than an average regional machinery complement as has been the more traditional procedure. Capital replacement charges for machinery and equipment are based on total estimated hours of useful life, rather than hours of annual use multiplied by the number of years owned. This computation results in lower capital replacement charges per acre, compared with the traditional aggregate budget generator approach. Cash receipts are determined using the observed yield on each farm. This procedure results in a set of unique COP budgets for each surveyed farm, rather than one average budget representing a set of farms. These budgets can then be used to develop weighted-average commodity costs of production by region or size of farm. In addition, estimates of the distribution of production costs around those means can be determined.

Information presented in this paper was developed from data obtained from rice farms surveyed in the 1984 FCRS. Individual rice cost-of-production budgets were estimated using production practice information reported by each farm operation. Estimated costs of production per planted acre were converted to costs per hundredweight (cwt) of rough rice, using the yield per planted acre reported by each survey farm. Expansion factors were used to determine the population estimates of rice farms and total rice production represented by each rice farm in the survey.^{1/} The percentage of farms and rice production produced at or below specified cost levels in each region were then estimated.

Distributions of rice farms and total rice production are presented for the United States and four major rice production regions. These four major production regions are: (1) Mississippi River Delta (includes the Delta areas of Arkansas, Mississippi, and Louisiana), (2) Arkansas non-Delta (includes the Grand Prairie and Northeast Arkansas), (3) Gulf Coast (includes Southwest Louisiana, Upper Texas Coast, and Lower Texas Coast), and (4) California.

Three measures of costs of production for rice are presented in this paper. Variable cash production expenses include costs of seed, fertilizer, chemicals, custom work, fuel and lubrication, repairs, drying, technical services, irrigation, and hired labor. Total production expenses include variable cash production expenses plus general farm overhead, taxes, insurance, interest, and capital replacement. Economic costs include variable cash expenses, general farm overhead, taxes, insurance, capital replacement, and opportunity costs of owned inputs used in the production process. These opportunity costs are estimated as the allocated returns to operating capital, other nonland capital, land, and unpaid labor.^{2/}

^{1/} An expansion factor is estimated for each farm in the survey and can be interpreted as the number of farms in the population, of a similar size and type, represented by each survey farm observation. The sum of the number of survey farms and production on each farm multiplied by their corresponding expansion factors yields estimates of the total number of farms and total production in a given area or region.

^{2/} Charges for operating capital use a 6-month U.S. Treasury bill rate. Nonland capital costs are estimated as the value of nonland assets used in rice production multiplied by the rate of return on production

Distribution of Farms and Production by Region

Distributions of rice farms and production by alternative measures of rice production costs for the United States and the four major rice production regions are shown in tables 1-5. The distributions of farms can be interpreted as the cumulative percentage of farms producing rice at or below specified cost levels. The distributions of rice production can be interpreted as the cumulative percentage of rice production produced at or below specified cost levels. The percentage of rice production produced at or below a particular cost level in a particular region can be matched with the corresponding percentage of farms on which that production occurred.

The distributions of U.S. rice farms and production by alternative measures of rice production costs in dollars per hundredweight (cwt) for 1984 are shown in table 1. Just over half of the farms (59.7 percent) had variable production expenses of \$4.50 per cwt or less. These farms accounted for 59.7 percent of U.S. rice production. Approximately 92 percent of farms, representing a similar percentage of production, reported variable production expenses of \$7.00 per cwt or less. In 1984, 75.5 percent of the rice production was produced at a total production expense level of \$8.00 per cwt or less. However, only 33.7 percent of the farms producing 38.8 percent of total rice production had estimated total economic costs of \$8.00 per cwt or less. The relationship between the percentage of U.S. farms producing rice, as well as the corresponding amount of production, at various levels of variable, total, and economic costs of production is illustrated in figure 1.

Nearly 63 percent of the rice farms in the Mississippi River Delta region reported variable production expenses of \$6.50 per cwt or less (table 2). These same farms represented 79.7 percent of the total rice production. Just over half of the farms (52.6 percent) had estimated total expenses of \$8.50 per cwt or less, producing 70.4 percent of regional production. At a total production expense level of \$9.00 per cwt, these percentages increased to 84.2 percent of farms and 88.8 percent of production. Approximately 70 percent of the farms in the region had estimated total economic costs of \$10.50 per cwt or less, accounting for 72 percent of total regional production.

Table 3 shows the distribution of rice farms and production for 1984 in the non-Delta region of Arkansas, the major U. S. production area. Over 80 percent of the farms representing a similar proportion of production reported variable production expenses of \$5.00 per cwt or less and total production expenses of \$7.50 per cwt or less. Around half of the rice production in the region was estimated to have been produced at variable cash expense levels of between \$4.00 and \$6.00 per cwt and at total expense levels of between \$5.00 and \$8.00 per cwt. Forty-eight percent of rice farms, accounting for 53.8 percent of production, had estimated total economic costs of \$8.50 per cwt or less and about 77 percent of the

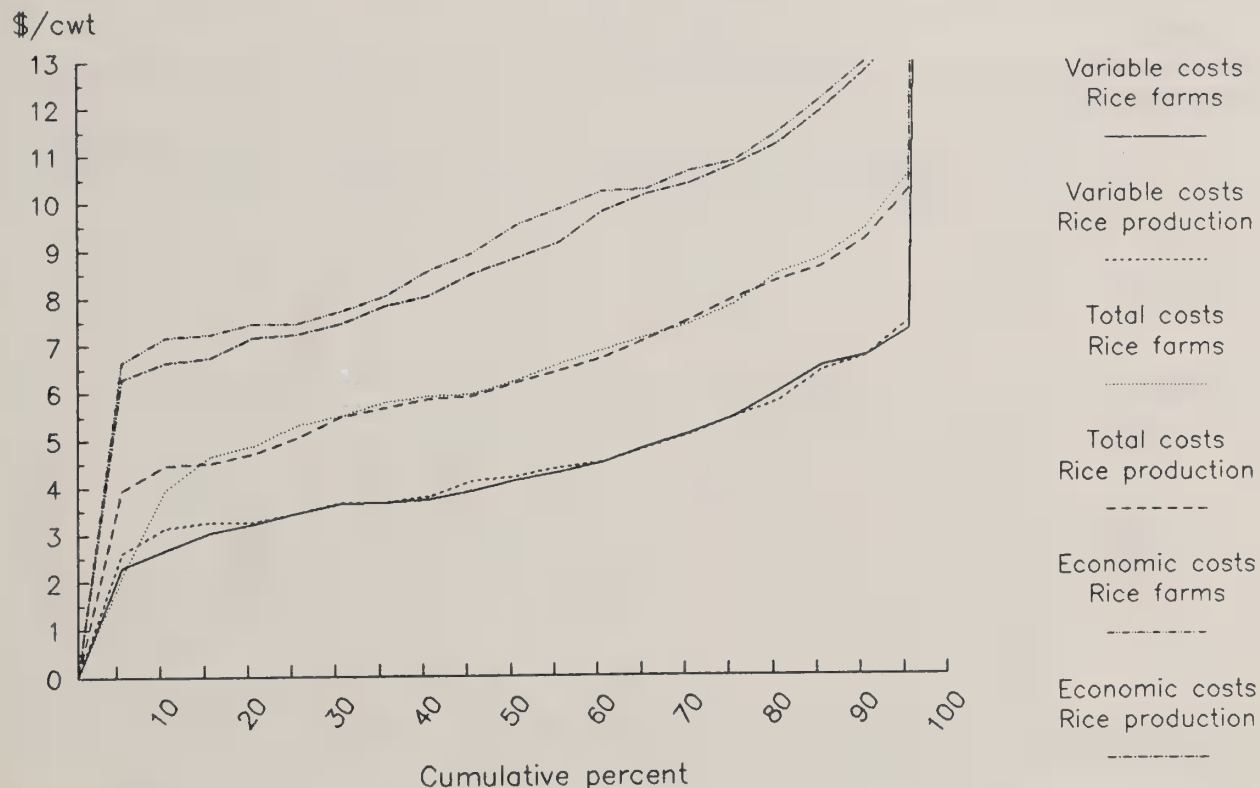
assets. Net land rent represents a composite cash/share rental value and is estimated by taking the per-acre cash rental rate and the per-acre share rental rate (less real estate taxes) from survey data and weighting each by its respective share of total acreage rented. The value of unpaid labor is allocated to the rice enterprise based upon rice sales as a percentage of total farm sales.

farms accounted for 80 percent of production and had estimated total economic costs of \$10.50 per cwt or less.

The Gulf Coast region exhibited somewhat higher levels of production costs per cwt than other rice producing areas. Approximately two-thirds of the farms reported variable production expenses of \$6.00 per cwt or less (table 4). These farms accounted for 64.2 percent of the total rice production in the region. About one-third of the farms, representing a similar proportion of total regional rice production, had estimated total production expenses of \$7.00 to \$10.50 per cwt. Less than half (45.8 percent) of the rice farms in the Gulf Coast region had total economic costs associated with rice production of \$10.50 or less, accounting for 46.4 percent of regional production.

The distribution of rice farms and total rice production by production cost level for California is shown in table 5. Higher yields per planted acre for farms in this region are reflected in the relatively larger percentages of farms and production reported at lower cost levels, compared with other rice-producing regions. Approximately 74 percent of farms producing 83 percent of production had estimated variable production expenses of \$5.00 per cwt or less. The distribution of farms and production at various levels of total production expenses ranged from

Figure 1--Distribution of U.S. rice farms and production by alternative measures of rice production costs, 1984



32.3 percent of farms, accounting for an equal percent of production, at a cost of \$5.00 per cwt or less to 92.6 percent of farms and 98.7 percent of production at a cost of \$10.00 per cwt or less. Just over half (50.4 percent) of the farms in the region had total economic costs of \$8.50 per cwt or less. Ninety percent of the 1984 production was estimated to have been produced at a total economic cost of \$11.00 per cwt or less.

Characteristics of Rice Farms by Costs per Hundredweight

This section presents differences in the structural and financial characteristics of rice farms within a given region. Average rice costs of production for 1984 are shown in table 6 for each of the four production regions and the United States. Major components of production costs include variable cash expenses, fixed cash expenses, total production expenses (including variable and fixed cash expenses as well as capital replacement costs), and total economic costs. Rice farms within each region were categorized into two groups. Farms with total economic production costs above the regional average were categorized as "high-cost" rice farms. Farms with total economic production costs below the regional average were categorized as "low-cost" rice farms. A similar procedure was used to classify all farms in the United States using the national average total economic cost for rice.

Across the United States, low-cost rice farms were slightly larger in total farm size, compared with high-cost rice farms. High-cost rice farms averaged 1,107 acres in size, with 281 acres owned and 863 rented (table 7). Low-cost farms averaged 1,390 acres in size, with 495 acres owned and 951 rented. Both groups of farms favored share rental arrangements over cash arrangements. Soybeans and wheat were the primary crops grown in conjunction with rice.

Low-cost rice farms in the Mississippi River Delta area were about twice as large as high-cost farms with an average farm size of 3,164 acres (table 8). Approximately 46 percent of the land operated was owned and a majority of the remainder was rented on a share basis. High-cost farms owned about 18 percent of the land operated, with the remainder divided equally between cash and share rent. Cotton, soybeans, sorghum, and wheat were the other major crops produced, with low-cost farms devoting a larger percentage of land to the production of soybeans and wheat.

Farms in the non-Delta region of Arkansas with total economic production costs below the regional average operated almost 300 acres more than farms with economic costs above the regional average (table 9). High-cost farms averaged 850 acres in size, with 247 acres owned. Low-cost farms averaged 1,108 acres in size, with 240 acres owned. Both groups of rice farms used share rental arrangements on about three-fourths of their total rented land. Rice, soybeans, and wheat were the major crops produced in each farm group.

Rice farms in the Gulf Coast region with economic production expenses above the regional average tended to be slightly larger in size than farms with production expenses below the regional average. High-cost farms averaged 1,314 acres, with 332 acres cash rented and 786 acres share rented (table 10). Low-cost farms averaged 1,077 acres, with 308 acres cash rented and 542 acres share rented. Both groups of farms

produced predominantly rice and soybeans along with sizable acreages devoted to pasture.

High-cost and low-cost rice farms in California operated similar-sized acreages, although a considerable portion of the acreage on high-cost farms was rented to others (table 11). High-cost farms operated an average of 1,167 acres with 1,169 acres owned, 436 acres cash or share rented, and 439 acres rented to others. Low-cost farms operated an average of 1,102 acres with 580 acres owned, 597 rented, and 75 rented to others. Farms in both cost groups devoted most of their planted crop acreage to rice. Average planted acreages of other crops were well below average rice acreage.

For the United States and three of the four production regions, low-cost farms devoted a smaller percentage of total operated acreage to rice production (tables 12-16). In California, the percentage of farm acreage planted in rice was slightly higher on low-cost farms (table 16). The smallest degree of specialization was observed in the Mississippi River Delta where rice farms planted about 15-16 percent of their land in rice (table 13). Farms in California had the highest degree of specialization, planting roughly 34-38 percent of their land in rice (table 16). In each region, low-cost farms reported higher average rice yields per planted acre than high-cost farms. Yield differences between high-cost and low-cost rice farms ranged from 4.58 cwt in California (table 16) to 9.96 cwt in the Gulf Coast (table 15). For the United States, rice yields on low-cost farms averaged 9.14 cwt per planted acre higher than yields on high-cost farms (table 12).

Average rice seeding rates and fertilization rates for each farm group are shown in tables 17 and 18. The largest difference in seeding rates were observed on farms in the Mississippi River Delta. High-cost farms in this region seeded rice fields at an average rate of about 23 pounds per acre more than low-cost farms. Little difference was observed in seeding rates between the two farm groups in the other three production regions. Average fertilization rates on rice fields were higher for high-cost farms in every region. Nitrogen application rates averaged 37 pounds per acre higher on high-cost farms across all U.S. rice farms.

Values of total farm assets, debt, and net worth as of January 1, 1985, are shown for the United States and each production region in tables 19-23. In the Mississippi River Delta and California regions, debt/asset ratios on low-cost rice farms were much lower than on high-cost rice farms (table 20). Little difference in average debt/asset ratios was observed between the two farm groups in the other two regions. For all U.S. rice farms, debt/asset ratios averaged 0.31 in both groups (table 19). Low-cost rice farms in the Mississippi River Delta and Arkansas (non-Delta) regions reported significantly lower machinery investment per acre than high-cost rice farms. This was primarily due to the fact that low-cost farms operated much larger farms than high-cost farms and could spread a given total investment of machinery over much larger acreages. This relationship was not observed in the Gulf Coast or California regions where high-cost and low-cost farms operated similar-sized farms.

Average values of farm income and expenses on rice farms for 1984 is shown in tables 24-28. These figures reflect estimates of income and expenses associated with all crop and livestock enterprises produced on

the farm. For all U.S. rice farms, high-cost farms reported average gross farm income of \$209,581 per farm, average operating expenses of \$194,941, and average net cash farm income of \$14,640 (table 24). Low-cost rice farms reported average gross farm income of \$288,316 per farm, average operating expenses of \$205,600, and average net cash farm income of \$82,716. Total gross farm income and net cash farm income averaged higher on low-cost farms, compared with high-cost farms, in every region. On a per acre of land operated basis, low-cost rice farms reported higher average gross farm income and lower average operating expenses (less interest) in three regions and lower average interest expenses in two regions.

Summary

This paper presented data on the distribution of rice production costs across farms and total production as well as differences in farm characteristics between high-cost and low-cost rice farms for major rice producing regions of the United States. Production cost estimates were developed with the use of an individual farm-level budget generator model, using 1984 FCRS data. In general, the distribution of variable and total production costs across farms was very similar to the distribution of production costs across total production. Cumulative percentages of farms producing at specific levels of total economic costs tended to account for somewhat larger percentages of rice production.

Across all U.S. rice farms, low-cost farms were slightly larger in terms of acres operated than high-cost farms, although some differences were observed within each region. Rice farms in the Mississippi River Delta, Arkansas (non-Delta), and the Gulf Coast had substantial planted acreages of soybeans and other crops, while farms in California tended to specialize primarily in rice production. From a whole-farm financial perspective, low-cost rice farms reported similar or lower average debt/asset ratios and significantly higher average values of net cash farm income, compared with high-cost farms.

Table 1--United States: Cumulative distribution of rice farms and production by alternative measures of rice production costs, 1984

Dollars per cwt	Variable expenses 1/		Total expenses 2/		Economic costs 3/	
	Farms	Production	Farms	Production	Farms	Production
	<u>Percent</u>					
\$3.00	13.2	7.9	0.3	0.6	0.3	0.6
\$3.50	25.9	25.9	.4	.6	.3	.6
\$4.00	46.7	43.0	10.6	5.5	.3	.6
\$4.50	59.7	59.7	12.9	10.2	.3	.6
\$5.00	66.2	67.6	22.0	24.5	1.1	.9
\$5.50	75.9	76.2	28.7	29.8	1.2	2.4
\$6.00	79.9	81.0	45.0	47.8	1.5	2.8
\$6.50	84.4	85.4	53.8	55.9	3.8	7.7
\$7.00	92.3	92.1	61.0	63.2	8.4	17.9
\$7.50	95.3	94.8	70.8	69.9	26.9	31.2
\$8.00	96.5	96.2	75.3	75.2	33.7	38.8
\$8.50	97.2	97.1	79.7	82.5	39.0	44.7
\$9.00	97.8	98.8	87.6	89.2	45.7	53.7
\$9.50	97.9	98.8	90.5	91.3	49.7	57.3
\$10.00	98.1	98.9	92.8	93.1	56.2	61.7
\$10.50	98.6	99.1	94.6	95.9	68.8	71.2
\$11.00	98.7	99.2	95.7	96.7	75.8	77.2
\$11.50	98.9	99.4	96.3	97.7	80.0	81.3
\$12.00	98.9	99.4	96.9	98.3	83.3	85.1

1/ Variable expenses include costs of seed, fertilizer, chemicals, custom work, fuel and lubricants, repairs, drying, technical services, irrigation, and hired labor.

2/ Total expenses include variable expenses plus general farm overhead, taxes, insurance, operating interest, and capital replacement.

3/ Economic costs include total expenses, excluding interest, and allocated returns to owned inputs.

Source: 1984 Farm Costs and Returns Survey.

Table 2--Mississippi River Delta: Cumulative distribution of rice farms and production by alternative measures of rice production costs, 1984

Dollars per cwt	Variable expenses 1/		Total expenses 2/		Economic costs 3/	
	Farms	Production	Farms	Production	Farms	Production
	<u>Percent</u>					
\$3.00	9.1	3.7	--	--	--	--
\$3.50	17.4	32.8	--	--	--	--
\$4.00	25.5	40.6	3.1	1.0	--	--
\$4.50	31.6	44.5	3.7	2.8	--	--
\$5.00	40.9	56.1	13.3	31.7	2.9	0.9
\$5.50	50.0	64.6	18.1	33.7	2.9	.9
\$6.00	57.0	74.5	23.1	42.0	3.1	1.0
\$6.50	62.8	79.7	28.8	46.9	5.4	4.5
\$7.00	89.9	92.3	34.8	53.3	13.1	32.8
\$7.50	94.7	96.6	44.0	63.2	13.8	34.5
\$8.00	95.6	97.3	48.1	67.8	19.9	39.5
\$8.50	96.3	97.8	52.6	70.4	29.2	47.2
\$9.00	97.4	98.8	84.2	88.8	32.4	52.6
\$9.50	97.8	99.0	88.7	92.4	39.8	56.0
\$10.00	98.0	99.1	92.8	94.2	42.1	58.8
\$10.50	98.2	99.2	93.6	95.0	69.7	72.3
\$11.00	98.2	99.2	94.4	95.9	74.9	79.5
\$11.50	98.2	99.2	95.1	97.2	81.6	85.0
\$12.00	98.2	99.2	95.7	97.6	85.5	87.4

-- = No observations at this cost level.

1/ Variable expenses include costs of seed, fertilizer, chemicals, custom work, fuel and lubricants, repairs, drying, technical services, irrigation, and hired labor.

2/ Total expenses include variable expenses plus general farm overhead, taxes, insurance, operating interest, and capital replacement.

3/ Economic costs include total expenses, excluding interest, and allocated returns to owned inputs.

Source: 1984 Farm Costs and Returns Survey.

Table 3--Arkansas (non-Delta): Cumulative distribution of rice farms and production by alternative measures of rice production costs, 1984

Dollars per cwt	Variable expenses 1/		Total expenses 2/		Economic costs 3/	
	Farms	Production	Farms	Production	Farms	Production
	<u>Percent</u>					
\$3.00	18.2	12.5	0.4	1.3	0.4	1.3
\$3.50	34.6	31.2	.4	1.3	.4	1.3
\$4.00	64.7	60.9	17.8	12.0	.4	1.3
\$4.50	78.3	77.1	18.9	17.0	.4	1.3
\$5.00	81.5	82.0	28.8	30.0	.4	1.3
\$5.50	91.9	90.6	34.3	33.0	.4	1.3
\$6.00	94.4	93.2	57.7	59.9	.5	1.7
\$6.50	97.1	96.3	67.2	68.6	2.6	7.9
\$7.00	98.3	97.7	75.0	75.8	5.7	12.5
\$7.50	99.3	98.1	87.4	84.8	38.3	40.5
\$8.00	99.6	98.6	91.4	89.6	44.1	47.9
\$8.50	100.0	100.0	94.4	93.5	48.2	53.8
\$9.00			94.9	95.4	55.9	60.8
\$9.50			96.0	95.6	57.3	62.8
\$10.00			97.5	97.5	65.5	67.6
\$10.50			98.6	98.2	76.5	80.0
\$11.00			99.6	98.6	84.5	84.9
\$11.50			100.0	100.0	88.0	88.9
\$12.00					90.2	91.5

1/ Variable expenses include costs of seed, fertilizer, chemicals, custom work, fuel and lubricants, repairs, drying, technical services, irrigation, and hired labor.

2/ Total expenses include variable expenses plus general farm overhead, taxes, insurance, operating interest, and capital replacement.

3/ Economic costs include total expenses, excluding interest, and allocated returns to owned inputs.

Source: 1984 Farm Costs and Returns Survey.

Table 4--Gulf Coast: Cumulative distribution of rice farms and production by alternative measures of rice production costs, 1984

Dollars per cwt	Variable expenses 1/		Total expenses 2/		Economic costs 3/	
	Farms	Production	Farms	Production	Farms	Production
	<u>Percent</u>					
\$3.00	5.7	3.0	0.3	0.6	0.3	0.6
\$3.50	11.1	11.1	.3	.6	.3	.6
\$4.00	22.8	18.3	3.0	1.9	3.0	.6
\$4.50	38.1	33.8	6.3	3.8	6.3	.6
\$5.00	49.5	44.3	8.7	4.9	8.7	1.0
\$5.50	61.4	58.9	18.5	13.0	18.5	7.1
\$6.00	67.3	64.2	29.8	27.4	29.8	7.9
\$6.50	74.0	70.7	38.3	35.1	38.3	9.3
\$7.00	81.4	81.5	45.7	45.0	45.7	10.9
\$7.50	88.1	86.4	52.4	49.0	52.4	14.0
\$8.00	90.9	89.7	59.6	57.3	59.6	19.3
\$8.50	93.0	90.7	67.9	68.5	67.9	22.5
\$9.00	94.6	96.6	74.0	75.9	74.0	30.5
\$9.50	94.6	96.6	78.5	79.2	78.5	34.4
\$10.00	94.6	96.6	81.1	81.5	81.1	41.0
\$10.50	96.4	97.2	86.6	91.1	86.6	46.4
\$11.00	97.0	97.9	88.8	92.8	88.8	54.6
\$11.50	98.0	98.4	89.0	93.5	89.0	59.0
\$12.00	98.0	98.4	91.2	95.5	91.2	66.1

1/ Variable expenses include costs of seed, fertilizer, chemicals, custom work, fuel and lubricants, repairs, drying, technical services, irrigation, and hired labor.

2/ Total expenses include variable expenses plus general farm overhead, taxes, insurance, operating interest, and capital replacement.

3/ Economic costs include total expenses, excluding interest, and allocated returns to owned inputs.

Source: 1984 Farm Costs and Returns Survey.

Table 5--California: Cumulative distribution of rice farms and production by alternative measures of rice production costs, 1984

Dollars per cwt	Variable expenses 1/		Total expenses 2/		Economic costs 3/	
	Farms	Production	Farms	Production	Farms	Production
	<u>Percent</u>					
\$3.00	11.5	9.9	--	--	--	--
\$3.50	28.8	27.6	--	--	--	--
\$4.00	46.7	43.2	3.8	2.3	--	--
\$4.50	66.5	75.8	14.1	13.2	--	--
\$5.00	73.5	82.8	32.3	32.3	--	--
\$5.50	75.8	83.4	44.1	42.5	--	--
\$6.00	77.4	86.1	56.7	57.5	--	--
\$6.50	83.8	89.6	68.8	68.3	5.1	8.8
\$7.00	88.6	94.9	75.0	73.0	16.7	22.2
\$7.50	91.2	97.3	78.2	75.3	28.5	32.3
\$8.00	93.4	99.2	79.8	78.3	44.0	46.1
\$8.50	93.4	99.2	83.7	92.6	50.4	53.4
\$9.00	93.4	99.2	85.3	95.0	58.8	71.6
\$9.50	93.4	99.2	90.8	97.9	65.1	78.6
\$10.00	95.2	99.5	92.6	98.7	68.2	80.7
\$10.50	96.7	99.7	92.6	98.7	75.5	85.7
\$11.00	96.7	99.7	92.6	98.7	77.8	89.8
\$11.50	96.7	99.7	94.9	99.3	81.6	92.1
\$12.00	96.7	99.7	94.9	99.3	85.5	95.6

-- = No observations at this cost level.

1/ Variable expenses include costs of seed, fertilizer, chemicals, custom work, fuel and lubricants, repairs, drying, technical services, irrigation, and hired labor.

2/ Total expenses include variable expenses plus general farm overhead, taxes, insurance, operating interest, and capital replacement.

3/ Economic costs include total expenses, excluding interest, and allocated returns to owned inputs.

Source: 1984 Farm Costs and Returns Survey.

Table 6--Average rice production costs per hundredweight by region, 1984

Region	Cash expenses		Total production expenses <u>1/</u>	Total economic costs
	Variable	Fixed		
<u>Dollars per cwt</u>				
Mississippi River Delta	4.90	1.68	7.35	9.19
Arkansas (non-Delta)	4.01	1.69	6.47	8.90
Gulf Coast	5.60	1.77	8.19	10.89
California	4.32	1.87	6.67	8.59
United States	4.64	1.74	7.11	9.39

1/ Includes capital replacement costs.

Source: 1984 Farm Costs and Returns Survey.

Table 7--United States: Average land use and tenure on high-cost and low-cost rice farms, 1984 1/

Land	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
	<u>Acres</u>	
Owned	281	495
Rented:		
Cash	286	191
Share	565	667
Free	12	93
Rented out	36	55
Total operated	1,107	1,390
Planted acreage:		
Rice	261	300
Barley	4/	2
Corn	7	6
Cotton	32	46
Oats	1	2
Peanuts	0	1
Sorghum	50	46
Soybeans	454	692
Sugarbeets	1	2
Sunflowers	1	4/
Vegetables	4	3
Wheat	115	223
Pasture	79	61

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the national average of \$9.39 per cwt.

3/ Farms with total economic production costs below the national average of \$9.39 per cwt.

4/ Average is less than 1, but greater than zero.

Source: 1984 Farm Costs and Returns Survey.

Table 8--Mississippi River Delta: Average land use and tenure on high-cost and low-cost rice farms, 1984 1/

Land	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
	<u>Acres</u>	
Owned	249	1,463
Rented:		
Cash	565	666
Share	619	1,107
Free	4/	0
Rented out	<u>28</u>	72
Total operated	1,405	3,164
Planted acreage:		
Rice	230	483
Corn	4/	4/
Cotton	<u>110</u>	<u>278</u>
Oats	4/	1
Sorghum	<u>78</u>	104
Soybeans	757	1,962
Sunflowers	4/	0
Wheat	<u>120</u>	768
Pasture	4	13

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$9.19 per cwt.

3/ Farms with total economic production costs below the regional average of \$9.19 per cwt.

4/ Average is less than 1, but greater than zero.

Source: 1984 Farm Costs and Returns Survey.

Table 9--Arkansas (non-Delta): Average land use and tenure on high-cost and low-cost rice farms, 1984 1/

Land	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
	<u>Acres</u>	
Owned	247	240
Rented:		
Cash	120	37
Share	469	670
Free	20	166
Rented out	6	6
Total operated	850	1,108
Planted acreage:		
Rice	205	220
Corn	<u>4/</u>	2
Cotton	3	6
Oats	0	1
Sorghum	45	39
Soybeans	415	646
Wheat	171	183
Pasture	11	12

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$8.90 per cwt.

3/ Farms with total economic production costs below the regional average of \$8.90 per cwt.

4/ Average is less than 1, but greater than zero.

Source: 1984 Farm Costs and Returns Survey.

Table 10--Gulf Coast: Average land use and tenure on high-cost and low-cost rice farms, 1984 1/

Land	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
	<u>Acres</u>	
Owned	288	230
Rented:		
Cash	332	308
Share	786	542
Free	14	7
Rented out	107	10
Total operated	1,314	1,077
Planted acreage:		
Rice	387	316
Corn	10	15
Cotton	18	0
Oats	0	4
Peanuts	0	3
Sorghum	35	47
Soybeans	350	309
Wheat	16	28
Pasture	183	196

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$10.89 per cwt.

3/ Farms with total economic production costs below the regional average of \$10.89 per cwt.

4/ Average is less than 1, but greater than zero.

Source: 1984 Farm Costs and Returns Survey.

Table 11--California: Average land use and tenure on high-cost and low-cost rice farms, 1984 1/

Land	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
	<u>Acres</u>	
Owned	1,169	580
Rented:		
Cash	70	247
Share	366	349
Free	0	1
Rented out	439	75
Total operated	1,167	1,102
Planted acreage:		
Rice	401	415
Barley	1	15
Corn	57	17
Cotton	0	31
Oats	9	<u>4/</u>
Sorghum	18	3
Sugarbeets	13	22
Sunflowers	11	1
Vegetables	52	25
Wheat	79	75
Pasture	339	173

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$8.59 per cwt.

3/ Farms with total economic production costs below the regional average of \$8.59 per cwt.

4/ Average is less than 1, but greater than zero.

Source: 1984 Farm Costs and Returns Survey.

Table 12--United States: Average rice yields and degree of specialization on high-cost and low-cost rice farms, 1984

Item	Unit	High-cost rice farms <u>1/</u>	Low-cost rice farms <u>2/</u>
Acreage:			
Rice	Acres	261	300
Total farm	Acres	1,107	1,390
Rice acreage as a share of farm acreage	Percent	23.6	21.6
Rice yield per planted acre	Cwt	46.11	55.25

1/ Farms with total economic production costs above the national average of \$9.39 per cwt.

2/ Farms with total economic production costs below the national average of \$9.39 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 13--Mississippi River Delta: Average rice yields and degree of specialization on high-cost and low-cost rice farms, 1984

Item	Unit	High-cost rice farms <u>1/</u>	Low-cost rice farms <u>2/</u>
Acreage:			
Rice	Acres	230	483
Total farm	Acres	1,405	3,164
Rice acreage as a share of farm acreage	Percent	16.4	15.3
Rice yield per planted acre	Cwt	42.51	47.27

1/ Farms with total economic production costs above the regional average of \$9.19 per cwt.

2/ Farms with total economic production costs below the regional average of \$9.19 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 14--Arkansas (non-Delta): Average rice yields and degree of specialization on high-cost and low-cost rice farms, 1984

Item	Unit	High-cost rice farms <u>1/</u>	Low-cost rice farms <u>2/</u>
Acreage:			
Rice	Acres	205	220
Total farm	Acres	850	1,108
Rice acreage as a share of farm acreage	Percent	24.1	19.9
Rice yield per planted acre	Cwt	46.81	51.44

1/ Farms with total economic production costs above the regional average of \$8.90 per cwt.

2/ Farms with total economic production costs below the regional average of \$8.90 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 15--Gulf Coast: Average rice yields and degree of specialization on high-cost and low-cost rice farms, 1984

Item	Unit	High-cost rice farms <u>1/</u>	Low-cost rice farms <u>2/</u>
Acreage:			
Rice	Acres	387	316
Total farm	Acres	1,314	1,077
Rice acreage as a share of farm acreage	Percent	29.5	29.3
Rice yield per planted acre	Cwt	43.35	53.31

1/ Farms with total economic production costs above the regional average of \$10.89 per cwt.

2/ Farms with total economic production costs below the regional average of \$10.89 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 16--California: Average rice yields and degree of specialization on high-cost and low-cost rice farms, 1984

Item	Unit	High-cost rice farms <u>1/</u>	Low-cost rice farms <u>2/</u>
Acreage:			
Rice	Acres	401	415
Total farm	Acres	1,167	1,102
Rice acreage as a share of farm acreage	Percent	34.4	37.7
Rice yield per planted acre	Cwt	67.75	72.33

1/ Farms with total economic production costs above the regional average of \$8.59 per cwt.

2/ Farms with total economic production costs below the regional average of \$8.59 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 17--Average seeding rates on high-cost and low-cost rice farms, 1984

Region	High-cost rice farms <u>1/</u>	Low-cost rice farms <u>2/</u>
	<u>Pounds per acre</u>	
Mississippi River Delta	164	141
Arkansas (non-Delta)	132	131
Gulf Coast	169	161
California	159	168
United States	153	146

1/ Farms with total economic production costs per cwt above the regional/national average.

2/ Farms with total economic production costs per cwt below the regional/national average.

Source: 1984 Farm Costs and Returns Survey.

Table 18--Average fertilization rates on high-cost
and low-cost rice farms by region, 1984

Region	High-cost rice farms <u>1</u> /	Low-cost rice farms <u>2</u> /
	<u>Pounds per acre</u>	
Mississippi River Delta:		
Nitrogen	D	115
Phosphate	2	1
Potash	4	2
Arkansas (non-Delta):		
Nitrogen	122	97
Phosphate	7	4
Potash	11	13
Gulf Coast:		
Nitrogen	118	105
Phosphate	49	43
Potash	34	32
California:		
Nitrogen	99	84
Phosphate	48	36
Potash	2	2
United States:		
Nitrogen	138	101
Phosphate	25	15
Potash	17	12

D = Insufficient data for disclosure.

1/ Farms with total economic production costs per cwt above the regional/national average.

2/ Farms with total economic production costs per cwt below the regional/national average.

Source: 1984 Farm Costs and Returns Survey.

Table 19--United States: Average value of farm assets, debt, and net worth on high-cost and low-cost rice farms, January 1, 1985 ^{1/}

Item	High-cost rice farms ^{2/}	Low-cost rice farms ^{3/}
<u>Dollars</u>		
Assets:		
Land and buildings	367,277	553,145
Trucks and automobiles	20,497	22,685
Tractors	61,327	54,209
Other equipment	74,054	79,536
Livestock and poultry	3,636	5,786
Purchased inputs on hand	907	4,939
Crops stored on/off farm	52,578	82,309
Total	580,276	802,610
Total farm debt	193,077	231,988
Total net worth	387,199	570,622
Debt/asset ratio	.33	.29
<u>Dollars per acre</u>		
Machinery investment	141	113
Assets	524	577
Debt	174	167
Net worth	350	410

^{1/} Numbers may not add due to rounding.

^{2/} Farms with total economic production costs above the national average of \$9.39 per cwt.

^{3/} Farms with total economic production costs below the national average of \$9.39 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 20--Mississippi River Delta: Average value of farm assets, debt, and net worth on high-cost and low-cost rice farms, January 1, 1985 ^{1/}

Item	High-cost rice farms ^{2/}	Low-cost rice farms ^{3/}
<u>Dollars</u>		
Assets:		
Land and buildings	268,503	1,106,075
Trucks and automobiles	29,398	44,066
Tractors	75,966	99,338
Other equipment	94,441	157,544
Livestock and poultry	3,084	6,136
Purchased inputs on hand	1,111	498
Crops stored on/off farm	61,825	132,566
Total	534,328	1,546,223
Total farm debt	247,256	471,966
Total net worth	287,072	1,074,256
Debt/asset ratio	.46	.31
<u>Dollars per acre</u>		
Machinery investment	142	95
Assets	380	489
Debt	176	149
Net worth	204	340

^{1/} Numbers may not add due to rounding.

^{2/} Farms with total economic production costs above the regional average of \$9.19 per cwt.

^{3/} Farms with total economic production costs below the regional average of \$9.19 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 21--Arkansas (non-Delta): Average value of farm assets, debt, and net worth on high-cost and low-cost rice farms, January 1, 1985 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Assets:		
Land and buildings	383,641	251,496
Trucks and automobiles	15,292	18,149
Tractors	51,494	32,538
Other equipment	59,024	51,951
Livestock and poultry	1,629	3,990
Purchased inputs on hand	426	6,862
Crops stored on/off farm	42,653	83,655
Total	554,159	448,641
Total farm debt	136,784	129,081
Total net worth	417,375	319,559
Debt/asset ratio	.25	.29
<u>Dollars per acre</u>		
Machinery investment	148	93
Assets	652	405
Debt	161	117
Net worth	491	288

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$8.90 per cwt.

3/ Farms with total economic production costs below the regional average of \$8.90 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 22--Gulf Coast: Average value of farm assets, debt, and net worth on high-cost and low-cost rice farms, January 1, 1985 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Assets:		
Land and buildings	357,019	360,824
Trucks and automobiles	20,514	18,741
Tractors	65,189	56,766
Other equipment	71,064	63,682
Livestock and poultry	5,663	11,080
Purchased inputs on hand	511	1,155
Crops stored on/off farm	71,727	48,056
Total	591,686	560,304
Total farm debt	190,575	203,643
Total net worth	401,111	356,661
Debt/asset ratio	.32	.36
<u>Dollars per acre</u>		
Machinery investment	119	129
Assets	450	520
Debt	145	189
Net worth	305	331

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$10.89 per cwt.

3/ Farms with total economic production costs below the regional average of \$10.89 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 23--California: Average value of farm assets, debt, and net worth on high-cost and low-cost rice farms, January 1, 1985 ^{1/}

Item	High-cost rice farms ^{2/}	Low-cost rice farms ^{3/}
<u>Dollars</u>		
Assets:		
Land and buildings	1,274,745	1,263,133
Trucks and automobiles	22,290	25,611
Tractors	75,088	93,337
Other equipment	122,637	137,748
Livestock and poultry	514	12,097
Purchased inputs on hand	7,504	5,072
Crops stored on/off farm	51,416	62,848
Total	1,554,194	1,599,846
Total farm debt	574,440	315,570
Total net worth	979,754	1,284,277
Debt/asset ratio	.37	.20
<u>Dollars per acre</u>		
Machinery investment	189	233
Assets	1,332	1,452
Debt	492	286
Net worth	840	1,166

^{1/} Numbers may not add due to rounding.

^{2/} Farms with total economic production costs above the regional average of \$8.59 per cwt.

^{3/} Farms with total economic production costs below the regional average of \$8.59 per cwt.

Source: 1984 Farm Costs and Returns Survey.

Table 24--United States: Average farm income and expenses on high-cost and low-cost rice farms, 1984 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Farm income:		
Crop and livestock sales <u>4/</u>	185,321	254,132
Government payments	18,741	21,846
Other	5,519	12,339
Total	209,581	288,316
Operating expenses:		
Fertilizer and lime	25,222	29,615
Chemicals	22,809	16,394
Paid labor	17,861	20,746
Custom work	3,816	4,440
Interest on--		
Real estate debt	8,085	16,391
Nonreal estate debt	15,543	18,707
Other	101,606	99,307
Total	194,941	205,600
Net cash farm income	14,640	82,716
Off-farm income	4,367	6,346
Total family income	19,007	89,062
<u>Dollars per acre</u>		
Gross farm income	189	207
Operating expenses <u>5/</u>	155	123
Interest	21	25
Net cash farm income	13	59

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the national average of \$9.39 per cwt.

3/ Farms with total economic production costs below the national average of \$9.39 per cwt.

4/ Value of CCC loans included in crop sales.

5/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 25--Mississippi River Delta: Average farm income and expenses on high-cost and low-cost rice farms, 1984 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Farm income:		
Crop and livestock sales <u>4/</u>	236,614	427,140
Government payments	23,326	17,172
Other	3,369	13,225
Total	263,309	457,537
Operating expenses:		
Fertilizer and lime	25,324	58,276
Chemicals	33,066	32,868
Paid labor	22,455	48,908
Custom work	5,031	7,714
Interest on--		
Real estate debt	8,174	41,589
Nonreal estate debt	22,356	37,360
Other	131,751	172,745
Total	248,158	399,460
Net cash farm income	15,151	58,077
Off-farm income	3,111	5,072
Total family income	18,262	63,149
<u>Dollars per acre</u>		
Gross farm income	187	144
Operating expenses <u>5/</u>	155	101
Interest	21	25
Net cash farm income	13	18

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$9.19 per cwt.

3/ Farms with total economic production costs below the regional average of \$9.19 per cwt.

4/ Value of CCC loans included in crop sales.

5/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 26--Arkansas (non-Delta): Average farm income and expenses on high-cost and low-cost rice farms, 1984 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Farm income:		
Crop and livestock sales <u>4/</u>	143,164	190,404
Government payments	13,452	21,022
Other	2,529	3,279
Total	159,145	214,705
Operating expenses:		
Fertilizer and lime	18,132	23,050
Chemicals	14,518	10,795
Paid labor	11,835	10,449
Custom work	1,957	490
Interest on--		
Real estate debt	6,175	8,678
Nonreal estate debt	10,672	10,871
Other	69,164	62,799
Total	132,453	127,132
Net cash farm income	26,692	87,573
Off-farm income	4,471	4,129
Total family income	31,163	91,702
<u>Dollars per acre</u>		
Gross farm income	187	194
Operating expenses <u>5/</u>	136	97
Interest	20	18
Net cash farm income	31	79

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$8.90 per cwt.

3/ Farms with total economic production costs below the regional average of \$8.90 per cwt.

4/ Value of CCC loans included in crop sales.

5/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 27--Gulf Coast: Average farm income and expenses on high-cost and low-cost rice farms, 1984 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Farm income:		
Crop and livestock sales <u>4/</u>	169,968	171,630
Government payments	20,926	18,470
Other	7,993	23,178
Total	198,887	213,278
Operating expenses:		
Fertilizer and lime	32,138	26,704
Chemicals	24,900	17,799
Paid labor	17,703	16,543
Custom work	5,404	2,317
Interest on--		
Real estate debt	5,687	10,191
Nonreal estate debt	16,074	15,472
Other	117,822	95,492
Total	219,728	184,518
Net cash farm income	-20,841	28,760
Off-farm income	5,393	8,283
Total family income	-15,448	37,043
<u>Dollars per acre</u>		
Gross farm income	151	198
Operating expenses <u>5/</u>	151	147
Interest	16	24
Net cash farm income	-16	27

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$10.89 per cwt.

3/ Farms with total economic production costs below the regional average of \$10.89 per cwt.

4/ Value of CCC loans included in crop sales.

5/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

Table 28--California: Average farm income and expenses on high-cost and low-cost rice farms, 1984 1/

Item	High-cost rice farms <u>2/</u>	Low-cost rice farms <u>3/</u>
<u>Dollars</u>		
Farm income:		
Crop and livestock sales <u>4/</u>	361,950	474,990
Government payments	24,885	42,432
Other	31,244	26,880
Total	418,078	544,303
Operating expenses:		
Fertilizer and lime	44,356	34,850
Chemicals	31,710	22,062
Paid labor	50,204	35,693
Custom work	11,877	21,429
Interest on--		
Real estate debt	42,749	20,000
Nonreal estate debt	39,590	25,305
Other	170,326	186,392
Total	390,812	345,731
Net cash farm income	27,266	198,572
Off-farm income	8,874	12,214
Total family income	26,140	210,786
<u>Dollars per acre</u>		
Gross farm income	358	494
Operating expenses <u>5/</u>	264	273
Interest	71	41
Net cash farm income	23	180

1/ Numbers may not add due to rounding.

2/ Farms with total economic production costs above the regional average of \$8.59 per cwt.

3/ Farms with total economic production costs below the regional average of \$8.59 per cwt.

4/ Value of CCC loans included in crop sales.

5/ Excluding interest.

Source: 1984 Farm Costs and Returns Survey.

